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STANDARDIZATION OF THE MOTOR DRIVE.

During the past few years considerable progress has been made in the standardization of certain machine parts, with results advantageous both to the machine manufacturer and to the machine user. For a long time it has been seen to be desirable, at least on the part of a number of tool builders, that something be done toward standardizing certain motor dimensions, speeds, etc., for machine-tool drive. At the recent spring convention of the National Machine Tool Builders' Association, a paper upon this subject was presented by Mr. Charles L. Fair, of Schenectady, N. Y., and the author's comments upon possible lines of progress in the direction of standardization deserve consideration.

The writer pointed out that it could not be expected that the electrical manufacturers would change existing standards of motor dimensions or speeds, nor is such a course desirable; but he saw no reason why, if the motor manufacturer in conjunction with the tool builder would co-operate, the former could not incorporate, at least in part, some agreed dimensions and speeds when bringing out new lines of motors. Obviously, it would be just as impossible for the various builders of motors to design their products to a single set of dimensions as for machine builders to follow such uniform practice. Notwithstanding this, much can be done to improve the situation.

An almost endless number of combinations of speeds is available, but from this great variety certain speeds should become the logical ones for the majority of drives. The direct-current shunt-motor speed, for instance, might be that of the alternating-current, 60-cycle motor. Alternating-current and direct-current motor speed should be given in terms of full load or possibly in terms of both no load and full load, bearing in mind the fact that the frequency fixes the alternating-current motor speeds, except as modified by slip. Adjustable-speed motors would naturally be higher in speed on the highest speed than a constant-speed motor, on the theory that the former would run only a percentage of the time on high speed. Adjustable-speed motors are more generally geared, and their speeds should be governed by a proper gear ratio.

Little difficulty should be encountered in arriving at a proper shaft diameter and key for a given horsepower, shaft length and speed of motor. Under the frame, uniformity of dimensions is clearly impossible, but much can be done to reduce the existing large va-

riety of dimensions to perhaps two or three sizes per frame. In one case mentioned by the author, eight different frame sizes were used by a single manufacturer in a single size of motor. There appears to be no reason why there should not be a uniform drilling of feet per frame.

Uniformity of marking motor terminals, standardization of wiring diagrams and the protection of live parts are all beneficial practices. The machine user, no less than the manufacturer, will derive considerable benefit from the elimination of needless variations in dimensions, patterns, shapes and weights, and it is probable that within the next few years real progress will be made in the direction of a more general motor standardization for machine-tool propulsion.

CONSTRUCTION FEATURES OF THE HOTEL GIBSON.

The modern hotel houses a multiplicity of electrical applications, the number and diversity of which can hardly be equalled except in those buildings devoted to industrial purposes. Not only must proper and elaborate illumination be provided, but efforts must be made to meet the exacting demands of the traveling public, which is always seeking to obtain the maximum number of conveniences. The hotel of today houses a complete motor-driven laundry, an extensive refrigerating plant including ice-making machinery and an extensive ice-water system, a complete telephone exchange, numerous signalling systems, a vacuum-cleaning system, motor-driven kitchen machinery and a great number of miscellaneous power applications.

The wiring of a modern hotel is hence a task of no mean proportions, as not only must provision be made to supply electric energy for power and light applications, but every effort must be made to make the control of these applications convenient without detracting from the beauty of the architectural layout of the guest and public portions. The Hotel Gibson, at Cincinnati, O., a description of the electrical installation of which begins in this issue, may be considered as a typical modern hotel.

The power plant of this hotel presents several interesting features. In place of three-wire generators, two-wire generators and balancer sets are employed, the balancer sets not only serving to maintain the voltage of the middle wire of the three-wire system when private-plant power is used, but also when the emergency two-wire central-station energy is used. The switchboard in this plant is an acme of convenience. All connections on the rear of the board are made in straight lines or at right angles, the feeder connections being made by means of copper rods and buses occupying a space over two feet in width, thus rendering repairs and inspection an easy matter when compared with the labor required to perform the same operations on a compact and often confusing switchboard where connections have to be traced first with extreme care.

In line with the convenience of the switchboard construction is that of the cable supports and anchors in the wire shafts. The cable racks are models of simplicity, being constructed of sheet steel and supporting the cables by means of porcelain cleats, and the conduits by means of U-bolts. By means of the doors of the steel boxes inclosing these racks, ready inspection is rendered possible, and additions to the present cable system can be easily made if ever deemed advisable. The similar accessibility of the cable anchors permits of taking up slack in the cables due to expansion from temperature or other causes at any time.

In spite of the accessibility of the cable supports and anchors, no unsightly effects are produced, as in the public and guest portions of the hotel all steel cabinets and boxes are hidden from view by doors conforming with the woodwork of the building.

The use of angle-iron frames as temporary supports for conduits until the panelboard cabinets became available is a feature which should appeal to every contractor. Building operations must proceed in spite of a contractor's inability to always have proper cabinets available at the time the conduits are laid, and the necessity for secure and accurate supports for conduits as a means for preventing dislocation is apparent.

ELECTRIC STERILIZATION OF MILK.

The sterilization of water by electric means was shown to be practical a number of years ago and installations for applying ultra-violet rays generated by electric lamps to this purpose have been applied on a large scale, particularly in Europe. The necessity for the sterilization of milk is quite as urgent as for water and this method was at once applied to the latter form of beverage, but without success. The opacity of the milk presented one obstacle and undesired effects made the process unsuitable.

More recently a process has been developed in Liverpool which accomplishes the desired sterilization by electrical means and seems to produce no objectionable results so far as the taste of the milk or other practical considerations are concerned. This has now been put into use upon a commercial scale and is described elsewhere in this issue. The method is based upon the use of a high-potential alternating current, which is passed through the milk as it traverses a thin tube. Tests show that the bacterial content is reduced almost to zero, the most objectionable species being entirely destroyed. Thus while the milk may not be made absolutely sterile it is rendered innocuous so far as the presence of disease-producing bacteria is concerned, such as those causing tuberculosis, typhoid fever, etc., frequently found in raw milk.

An application of electric current to this purpose has been much sought after in the United States and if the new method satisfactorily meets the tests to which it will be subjected, it will undoubtedly receive wide application in this country, and become an important competitor of sterilization by heat.

TRANSFORMER DESIGN AND OPERATION.

The paper presented by Mr. D. W. Roper at the Pittsfield meeting of the American Institute of Electrical Engineers, and abstracted in our last issue, gave results of some very valuable experience in the operation of distributing transformers and pointed out how the trouble arising from transformer failures can be materially cut down. While the number of failures of this class is already exceedingly small when the number of transformers in use is considered, showing that the transformer of today is a very dependable and rugged piece of apparatus, it is, nevertheless, very desirable both from the standpoint of costs of repairs and continuity of service to reduce the failures to the lowest possible minimum.

To achieve the desired result requires of course the co-operation of manufacturers and users. Manufacturers need to know the results of the experience in operation and this is dependent upon the accumulation of such facts as Mr. Roper presented in his paper. Moreover, the determination of transformer design and the formulation of specifications which transformers are to meet depends also upon such co-operation. While any buyer may, of course, draw up his own specifications, he will find that if these are different from the requirements of other users and consequently from the stock production of the factory, he will have to pay perhaps dearly for his departures from general practice.

It is consequently desirable to have general specifications drawn up which will be satisfactory to nearly all users and will enable the manufacturers to meet all demands by one line of product. There will be many items upon which all cannot agree, since the requirements of small and large operating companies may be conflicting. This statement applies for instance to the furnishing of oil. On the other hand many points of the criticism of present designs brought out by Mr. Roper are of general application and manufacturing practice might well be revised in accordance with them.

Many troubles which arise in practice are more dependent upon operating methods than upon the construction of the transformer. The difference in failures noted as dependent upon whether a lightning arrester is placed upon the same pole as a transformer is an important one and it is for each operating company to determine whether such increases in expense as are entailed by supplying a lightning arrester for each transformer are warranted in attaining greater continuity of service and less frequent accidents to the transformers.

The question of using a connection board is another point requiring careful consideration. The manufacturers seem to think that they have eliminated the trouble from this source.

Such papers as that of Mr. Roper and the discussions which are brought out by them represent a class of the most valuable material which can be brought forward at such conventions.

ADVERTISING VALUE OF GOOD STREET-CAR LIGHTING.

Good lighting as a business stimulator for the central-station company has no equal. Much to the profit of all concerned, electric companies are rapidly realizing this and it cannot be long before efficient lighting installations will be the rule rather than the exception.

It seems, though, that a very excellent method of educating the public to a realization of what scientific illumination really means is being consistently neglected in the campaign for better lighting. It is needless to comment on the extensive work that has been undertaken by electric utility companies in improving lighting in the home, office and public institutions. Commercial departments more recently, perhaps, have also been putting forth every effort to extend and improve street lighting, show-window lighting, sign lighting and display lighting of all varieties, yet the street car, which is used daily by a large percentage of the entire population of the city, is in many cases abominably lighted, and seldom represents the best practice.

Aside from the results which would be obtained by providing good lighting in street cars from the railway operator's standpoint, it would appear that no advertisement would receive more consideration or have a greater effect on such a large number of people; demonstrating to the public just what pleasing results can be obtained when the lighting equipment is properly selected and properly installed. It seems almost ridiculous for a utility company to strive to have its city known as a well lighted one and entirely neglect the street car. Yet this is the case in many localities.

Some time ago the Toledo Railways & Light Company, Toledo, O., equipped all of its cars with modern lighting units in accordance with the best engineering practice. The change from the old equipment was quickly observed by all passengers, but the company emphasized the change by inserting in the daily newspapers advertisements calling particular attention to the new installation and commenting on the effects that result from the use of proper lighting equipment. It is said that remarkable results have been obtained from this campaign. When both the railway and electric utilities are controlled by one organization it would seem from the experiences of the Toledo Company that much good can be accomplished in this direction. There is also a field for co-operation when separate companies are in control. In a good many instances the railway company is a customer of the central station and in this capacity should be accorded the same treatment as is given the ordinary lighting customer. Undoubtedly it can be shown in many cases that energy consumption can be reduced by a substitution of proper lamps and glassware, and a co-operative campaign can be conducted along these lines, with benefits to both utilities.

Meeting of Pittsburgh Section.

The annual election of officers of the Pittsburgh Section of the American Institute of Electrical Engineers was held on June 9, with the following results:

Chairman, J. W. Welsh; secretary and treasurer, Chas. R. Riker; board of directors, G. M. Eaton, B. Wiley, B. C. Dennison, E. R. Spencer, T. H. Schoepf, Ray Dudley.

Papers were read by R. L. Snyder on "Some Recent Improvements in Telephone Practice" and by J. Gordon on "Spinners of Speech." Mr. Snyder said in brief that in spite of the remarkable inventions which have brought the telephone to its present stage of usefulness, improvements are being constantly introduced. The ordinary receiver is so sensitive that the energy consumed in lighting an ordinary electric lamp would be sufficient to produce an audible sound in every receiver in the United States, and improvements are still being made. The amount of improvement in telephone apparatus is spoken of in terms of its effect on transmission, the unit being a transmission-mile.

The standard circuit for making comparisons consists of subscriber's set, an artificial line and a receiver set. The volume of transmission over this standard circuit is increased or decreased by increasing or decreasing the length of cable pair included in the circuit. Comparison is made by cutting line in or out until the transmission is the same as with the apparatus on test substituted for the cable pair. Conversation can be carried on with comparative ease over a line of 30-mile transmission equivalent. All circuits between subscribers in what is known as the Pittsburgh Metropolitan area are designed to give a 19-mile transmission equivalent or better. Toll line transmission between cities varies from a 20 to a 30-mile equivalent. On toll lines the potential used is double that for local connections.

A phantom circuit which consists of a third telephone circuit superimposed upon two physical circuits by placing balanced repeating coils at each end of the physical circuits, must be transposed the same as the side circuits. This was impossible until the duplex or quadded cable in which the twisted pairs of wires are again twisted around each other, was designed. The phantom circuit has twice the conductivity of the side circuits and hence gives better transmission making long-distance toll calls a success. The introduction of loading coils and inequality repeating coils also had much to do with this improvement in transmission.

Among the improvements which have helped to cheapen construction is the 900-pair cable, which gives a 50-per cent increase in capacity over that of the 600-pair cable, with the same outside diameter.

The switchboard is gradually undergoing changes which lessen the work of the operator. With machine ringing, for instance, the operator can handle 27 to 40 per cent more calls than with the old manual ringing system.

Mr. Gordon gave a description of the actual operation of the switchboard and of the methods of line construction illustrated fully with stereopticon and motion-picture views.

The discussion which followed brought out that the phantom circuits are not used for local work, primarily on account of signalling difficulties and that phantom circuits may be superimposed although not in common use on the Bell lines. In conclusion, Mr. Snyder emphasized the importance of a high standard of line work on the part of power companies when crossing or running parallel with telephone lines.

The Institute of Radio Engineers.

At a meeting of the Institute of Radio Engineers, held at New York City on June 3, Melville Eastham, of Boston, Mass., presented a paper on the methods of radio transmission, involving high group frequency and sending apparatus. He described a number of types of apparatus, using rotary quenching spark gaps and operating on both direct and alternating-current source of supply. A characteristic feature of the method used is that ordinarily a low-frequency alternating current or a direct current is used to produce sparks recurring at a rate above the upper limit of audibility, and the very rapid groups of electromagnetic waves thus erected are further subdivided into trains at audible frequencies. In this way it is said to be possible to secure higher over-all efficiency than by the common methods of conversion involving motor-generators.

Society for Electrical Development Offers Prizes.

The Society for Electrical Development, Incorporated, announces eight prizes for the best stories, articles or reports on any subject pertaining to commercial electricity. The competition is open to employees of members of the Society. There will be one prize of $250, one of $150, one of $50 and five of $10 each. The competition closes on September 1, 1914. Full particulars may be obtained by writing to the Competition Editor, Society for Electrical Development, Incorporated. 29 West Thirty-ninth Street, New York City.

Canadian Association to Meet.

The twenty-fourth annual convention of the Canadian Electrical Association will be held in Montreal, June 24-27, with headquarters at the Ritz-Carlton Hotel.

Local committees have been appointed and consist of the following: General Committee: Major Hutcheson and J. S. Norris, joint chairmen, and L. D. McFarlane, E. F. Sise, G. H. Olney, R. S. Kelch, R. J. Jones, J. M. Robertson, L. Herdt; Ways and Means Committee: J. C. Smith, chairman, and K. B. Thornton, J. A. Shaw, R. H. Balfour, W. F. Graves, R. F. Morkill; Entertainment Committee: L. Grant, Chairman, and A. Boyd, P. Sise, R. G. Harris, W. C. Lancaster, W. H. Winter, H. C. Post, R. Roper, Powell and R. M. Wilson; Publicity Committee: S. W. Smith, chairman, and W. J. Doherty, L. J. Belnap; Finance Committee: J. W. Pilcher, chairman, and C. F. Medbury, F. W. Smith, R. M. Wilson, L. B. Belnay. P. T Davies is honorable secretary.

A special programme has been prepared by the Entertainment Committee which is sure to appeal to all vistors. Special souvenirs have been provided for the ladies.

Municipal Electricians to Convene.

The nineteenth annual convention of the International Association of Municipal Electricians will be held in Atlantic City, N. J., September 15 to 18, with headquarters at the Hotel Isleworth. An excellent program of papers and addresses is in preparation. As usual, a fine array of exhibits will be displayed and new products demonstrated. Arrangements already made and others in hand indicate that this will be the banner convention of the Association. Special care will be given the ladies; the piers will be at their disposal with roller chairs waiting at all times. The secretary of the Association is Clarence R. George, Houston, Texas.

Memphis Electrical Exposition.

The Jovian League of Memphis, Tenn., is this week conducting an Electrical Exposition in that city, to which admission is free. The exhibit hall is 75 by 150 feet, in addition to which there is a lecture and demonstration hall 30 by 60 feet. Both interior and exterior of building are brilliantly lighted and decorated. Electrical appliances to the value of $750 are being given away as prizes.

Among interesting features of the Exposition are an electrical fountain, an electrical refrigeration plant, a wireless telegraph station, the manufacture of tungsten lamps, a street-railway demonstration, high-potential apparatus, automatic telephone system, etc.

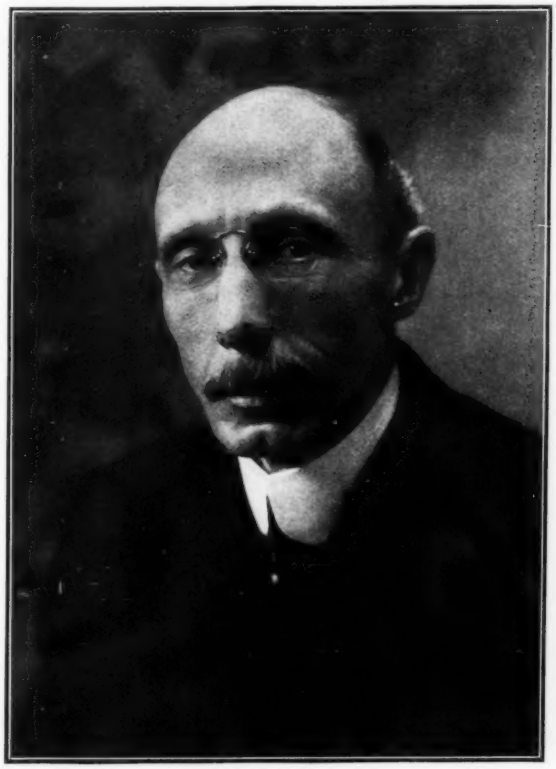
Charles Blizard.

The development of the electric storage battery is so intimately related with the development of the electrical industry as a whole, that being a part of the former development indicates an experience and contact with practically all that can be said today with respect to the commercial applications of electrical energy.

A prominent figure at every convention of electrical men where things of importance are being done, vigorous, sturdy and still a young man, Charles Blizard, the subject of this sketch, was in it when the electric storage battery first became a thing of utility and usefulness.

Mr. Blizard was born at Stevens Point, Wis., at that time a lumbering town 25 miles from any railroad. Going east he received his education at the Newburgh Institute, Newburgh, N. Y., and at the Brooklyn Collegiate and Polytechnic Institute, of Brooklyn, N. Y. His early business experience was in a financial way, and he was employed in Wall Street for about 10 years. He took charge of the affairs of the Franklin Accumulator Company in New York, in which concern a considerable amount of money had been invested in an attempt to develop an alleged new form of Planté battery. Mr. Blizard's job was to determine whether the money could be saved and if not to wind up the affairs of the concern. For two years he sold these batteries, returned to the shop and made them, installed them, and then sometimes collected the money for them. The battery was successful in line work and was adopted by the Western Union Telegraph Company to displace primary cells under certain conditions. The company spent a great deal of money and Blizard spent a great deal of time in endeavoring to successfully apply the battery to street-car propulsion, and it was used in experiments upon the P Street line in Washington, D. C. In special applications the battery was a success, but for general storage-battery use it was a failure. The company paid its debts in full and closed up shop.

Just about that time, 1893, the Electric Storage Battery Company put the chloride accumulator on the market, and Mr. Blizard became manager of its New York office. He remained in that position until 1900, when he went to Philadelphia as manager of the sales department, and was later elected third vice-president in charge of sales, the position he now holds.



Charles Blizard,
Third Vice-President of the Electric Storage Battery Company.

Strike at Westinghouse Works.

For the past two weeks the works of the Westinghouse Electric & Manufacturing Company, at East Pittsburgh, Pa., have been partly shut down on account of a strike by the employees. Prior to the strike a committee of workmen presented a petition asking the company to deal with a committee for the adjustment of all grievances arising in the plant, and stating the following as grievances already existing: (1) the reinstatement of men laid off in place of hiring new men; (2) the elimination of bonus, premium and piecework systems; (3) rotation of lay off during slack season for all employees whose temporary lay off would not hamper operations.

Vice-president Davis talked with the men but declined to grant the petition.

A newly formed labor union, known as the Allegheny Congenial Industrial Union, is conducting the strike.

With the exception of arrangements for the protection of the shops from fire and violence, the company has made no effort to push the resumption of operations, although the gates have been open every day as usual and several hundred employees have succeeded in coming in and working.

The spirit of optimism seems to prevail among the officers in regard to the strike situation, and there is a feeling that in a short time there will be a general movement to return to work on the part of a majority of their men.

On Friday of last week a number of employees of the Union Switch & Signal Company walked out at noon without presenting any reasons for so doing. The Company promptly announced that the works would be shut down until Monday, at which time the employees would be expected to return. Practically the full quota of men has now returned, and this, coupled with the unsuccessful attempt of the strikers to call out the men at the Westinghouse foundries at Trafford City, has given their cause a serious setback.

When asked as to the effect of the strike on the business of the companies, one of the officers stated that owing to the policy adopted several months ago of manufacturing goods for stock in order to provide work for its employees during the dull period, a large amount of goods, sufficient in many lines for several months' requirements, had been made and distributed to the company's warehouses in various parts of the country, from which orders have been filled daily without delay.

Utah Trade Excursion

Mention was made in our issue of June 6 of the trade excursion undertaken by the Commercial Club of Salt Lake City, Utah, into northern Utah and southern Idaho. That the electrical industry had eight representatives out of a total of seventy business men on the excursion is an indication of the importancee which the electrical industry has assumed in the business community.

The excursionists report that the electrical industry generally in Idaho is in a flourishing condition. In one of two places where competition has been particularly keen during the past several months, the companies have been brought to a standstill by the somewhat dull times, and little progress can be made until some kind of a reorganization and readjustment is effected.

The early crop prospects this year are better than they have been for several seasons, and business should open up splendidly in the rural communities as soon as the crops are assured.

Philadelphia Vehicle Association Meeting.

The regular monthly meeting of the Philadelphia Section of the Electric Vehicle Association of America was held on June 10, at The Philadelphia Electric Company's rooms, 226 South Eleventh Street, Philadelphia, Pa., Chairman R. L. Lloyd presiding. After the regular routine business was disposed of the speaker of the evening Lieutenant W. B. Mills, of the Philadelphia Traffic Squad was introduced. The subject of Lieutenant Mills' paper was "Traffic Regulations."

In growing dense populations, the question of transportation and congestion of traffic in the ever narrowing, by comparison, highways of the larger cities becomes a serious problem. Speed is ever uppermost in the minds of the people, said Lieutenant Mills, but the speed must take second place under consideration of the three points of safety of pedestrians, safety of the driver of the vehicle, and the expeditious handling of merchandise in loading and unloading.

Unidirectional traffic on narrow streets and on one side only of the broader streets has been largely adopted to great advantage, but Lieutenant Mills expects to see in the not distant future an arrangement of city streets whereby the street crossings will be on different levels so that the traffic can proceed uninterruptedly in a given direction. The parking of cars is becoming a serious problem, he said, when it is considered that office buildings now house several hundred people, many of whom use automobiles which are left outside in a convenient spot while they are in their offices. The question is now being considered whether all parking in public streets will have to be abolished.

Touching on statistics, Lieutenant Mills said that this year, so far, there have been but four accidents in Philadelphia, where formerly there were 600 during the same period. This good record is due to the improved conditions under the present regulations. As far back as Lieutenant Mills had an opportunity to look in his records there had been no accidents in which an electric vehicle took part, and he ascribed this to the facility with which the electric vehicle can be started and stopped, in case of emergency. The following gentlemen entered into the discussion: Messrs. Browning, Eaton, Metcalf, Cordner, Fredericks, Hancock, and Bartlett.

Sixty members and guests were present and everyone expressed himself as being benefited by the paper and discussion. The chairman announced that this would be the last meeting until the fall. He called particular attention to the national convention which will be held in the Bellevue-Stratford, Philadelphia, on October 19-21. Two new members have been secured since the last meeting, making the total 56 to date.

Chicago Vehicle Association Meeting.

The June meeting of the Chicago Section, Electric Vehicle Association of America, was held in Kuntz-Remmler's Green Room on June 10. Plans were discussed for the joint picnic of the members of the Garage Owner's Association of Chicago, and the local section of the Electric Vehicle Association, on August 12. Upon the recommendation of the Executive Committee, it was decided to cast a mail ballot on the motion to change the Constitution and Rules of Procedure so as to conform with those recommended by the National Association.

G. H. Jones, Homer E. Neisz and C. F. Frayer delivered short talks on the National Electric Light Association's last convention. Mr. Jones called attention to the prominence that was given the electric vehicle at this convention, papers having been delivered on the subject by C. P. Steinmetz and W. P. Kennedy, and electric-vehicle problems and data being included in the Electrical Salesman's Handbook and the report of the committee on Non-Peak and High-Load-Factor Business.

H. Salvat called attention to some of the fine electric-vehicle records made in Chicago, quoting one case where 109 miles was made on one charge.

Columbus Jovians Have Outing.

Columbus, O., Jovians held their third annual picnic at Buckeye Lake, about twenty miles east of the city and the favorite outdoor resort of central Ohio, on Thursday, June 11. There were 120 local electricians in attendance, and this number augmented by friends and members of families made up a large picnic crowd. The main party left at noon over the Toledo & Ohio Central Railway.

There was no formal program, but as Buckeye Lake has street-car park attractions, several hundred motor boats and an amusement pier, besides affording excellent fishing, the opportunities for having a good time were legion. An indoor ball game was played between two picked nines of Jovians. A chicken and fish dinner was served at the Sunset Club. The committee of arrangements, consisted of W. A. Hopkins, of the Erner-Hopkins Company, L. A. Sackett, of the Sackett Mill & Mine Supply Company, and A. E. Loeb, of the Avery-Loeb Electric Company.

Louisville Jovian League Organized.

At their regular June meeting a few days ago the Louisville, Ky., Jovians effected the formal organization of the Louisville Jovian League, with R. E. Brian, manager of the local office of the Federal Sign System (Electric), as president. Robert Montgomery, manager of the commercial department of the Louisville Gas & Electric Company was elected vice-president, and Carl A. Klemm, manager of the local branch of the Westinghouse Electric & Manufacturing Company, secretary. The members of the Board of Directors include James Clark, Jr., statesman of the Order and president of the James Clark, Jr., Electric Company, and Capt. Walter O. Smith, superintendent of construction of the Louisville Gas & Electric Company.

The next meeting of the League will be an open air meeting to be held in July at Senning's Park, a local resort. The wives and sweethearts of the members will be in attendance and several entertainment features will be provided. The regular meetings of the League are to be held monthly at the Tyler Hotel The committee in charge of that phase of the League's activities is working on the organization of a baseball team.

Philadelphia Jovians to Have Big Outing.

The annual outing of the Philadelphia Jovian League will be held on Saturday afternoon, June 27, at Kuglers' Roost on the Delaware (Morris Station, N. J.). The arrangements are being made by the Sports and Entertainment Committee, of which Frank P. Groves is chairman. All indications are that a fine program of baseball and other sports, together with music and dancing, and an abundance of food and liquid refreshments will be provided.

Chicago Jovian League.

A get-together meeting of the Chicago Jovian League was held on June 15, this being the last meeting of the League until September 14. It was voted to hold a picnic some time during the summer and a committee was appointed to make the necessary arrangements. Remarks were made by Perry Boole, George C. Richards and Thomas G. Grier.

Pennsylvania State Convention.

The next annual convention of the Pennsylvania Electric Association, which is a section of the National Electric Light Association, will be held at Eagles Mere, Pa., September 8, 9, 10 and 11. S. E. Pohe, of Bloomsburg, Pa., is secretary.

Electricity in Grain Elevators.

By H. E. Young.

This article, prepared by the sales manager of the Minneapolis General Electric Company, discusses the general advantages of motor drive for grain elevators, presenting detailed data on several noteworthy installations purchasing power from the company. Considerable valuable data are also given on the power requirements of the various machines employed in the industry.

The application of the electric motor to the handling and cleaning of grain dates back to the time when electricity first began to force itself into industrial applications, due to the wonderful economies effected by its use. It would be folly indeed to try to estimate, even roughly, the number of bushels of grain that are today handled by the electric motor, that were in the past handled by the isolated steam plant.

As far as we are aware, there has been a lack of technical data published, relative to the application of electricity in grain elevators, and the object of this article is to describe actual installations, the data from which should be of value to the power engineer whose efforts may be required in this direction. In recommending the adoption of central-station service for grain elevators, the power engineer should be amply provided with facts and figures, relative to the economy, reliability and advantages of motor drive in elevators, as only by a thorough knowledge of existing practice, combined with present tendencies in the direction of economy, can the best results be obtained.

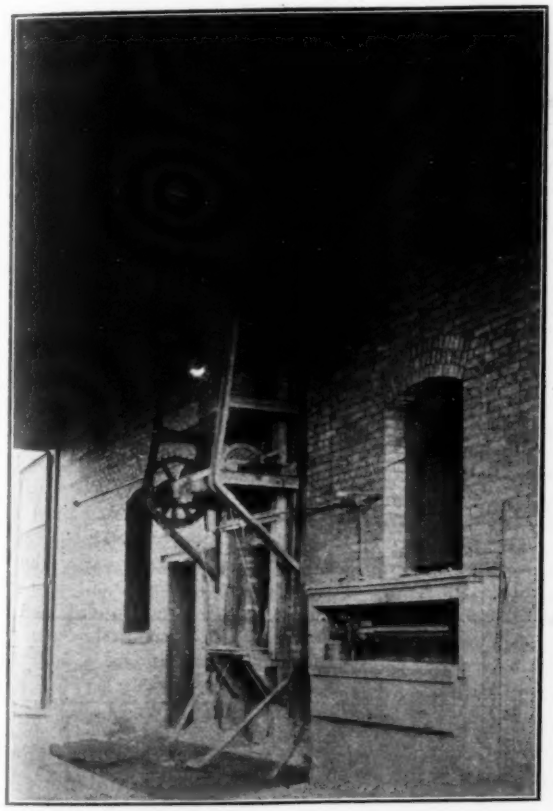


Fig. 1.—Unloading Shovel Driven by 15-Horsepower Motor.

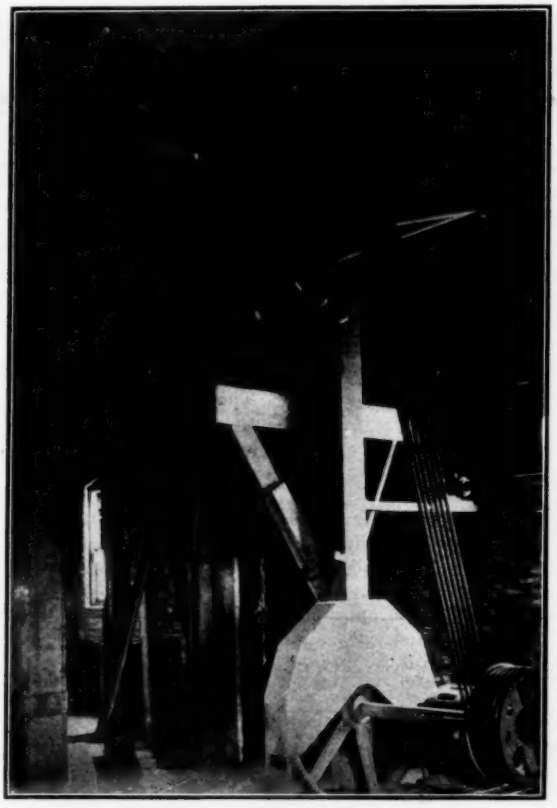


Fig. 2.—20-Horsepower Motor Driving Two Barley Cleaner Legs.

The application of electric power is first of all an engineering problem, and especially is this true in connection with grain elevators, as each individual elevator must be considered as an entirely separate proposition, and must be handled according to its particular class of business, with consideration as to its general lay-out. In a tour of a large number of elevators in the city of Minneapolis, the grain center of the country, the similarity of drives and motor applications was conspicuous by its absence. In no case would it have been good engineering practice to consider, any more than in a general way, the individual application of any one motor and try to apply the data secured to any one particular case. In other words, each elevator must be considered as an absolutely separate problem and must be handled as such, if all the advantages and economies due to the use of electricity are to be obtained.

In this connection it should be mentioned that due to the difference in the condition of the various grains, when received, the lay-out of the house and the varying amounts of time devoted to cleaning and handling, it is found that the storage capacity of an elevator has no relation to the power demand, and for these reasons, it is unreliable to estimate the consumption of a given

elevator, using as a basis another elevator handling a similar amount of grain.

As an example of one of the most modern elevators in the Middle West which is using central-station service exclusively, the following description, together with the accompanying views are especially interesting.

The Gould Elevator Company is an excellent example of individual drive as applied to a modern elevator, and for this particular installation, the individual drive has proved to be the most efficient.

In order to get a clear understanding as to the functions performed by the various motors used in an elevator, we shall endeavor to follow the grain from the time of its arrival to the time of its departure.

The duties of a grain elevator are to receive wheat, oats, corn, barley, etc., from cars, and to hold same in storage until required for shipment. A large percentage of elevators are equipped for the cleaning and weighing of the grain and these processes are incidental to storage.

It is well to make note at this point that many elevators operate in connection with their cleaning department, a department known as a purifying mill. This consists of the treatment of the grain with steam and sulphur fumes in order to put it in a better marketable condition. The fact that steam is needed for this process is a great aid in changing elevators from engine to motor drive, as it is not necessary to "scrap" the boiler equipment. These units being necessary for the generation of steam for the above process are still retained as a necessary part of the equipment of the plant, and also furnish steam for heating during the winter months, providing it can be done more economically than by small isolated heating units. In changing of the plants in the Minneapolis territory, the central station finds this is a very easy solution of the prejudice which naturally exists against "scraping" first-class equipment, though it is frequently necessary when the mills have not been operating purifying processes, to show that the installation of this additional machinery, necessary to put in a purifying mill is a money maker, insomuch as the main investment is represented by boilers, which has already been made.

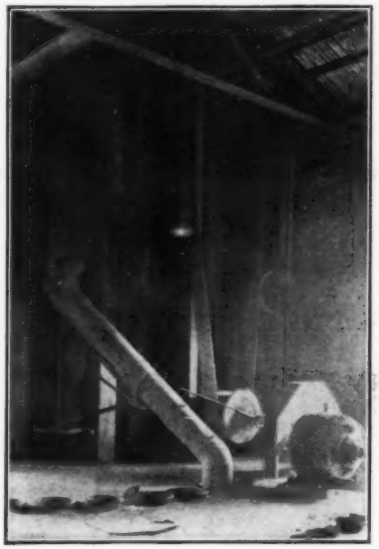


Fig. 3.—Showing Spouts by Which a Leg Can Be Made to Discharge Into Any Bin Desired.

The grain is brought to the elevator in carload lots, left in the elevator-company's siding, from whence it is pulled by means of a car puller and located directly over the receiving hopper which is at the side of the track, level with the floor, and covered with a heaving iron grating. The boards covering the door of the car are then removed and the grain allowed to fall by gravity into the receiving hopper. Power-driven shovels are then used to clear the car of the balance of the grain that will not run out of its own accord. The shovels are usually arranged so that when pulled to the farthest corner of the car a clutch is engaged,—thus winding up the cable to which the shovel is attached—the attendant simply having to manipulate the shovel and thus clear the car.

From the receiving hoppers, the grain is raised by an endless belt, to which are attached buckets of size depending on the amount of grain to be handled. These bucket conveyors are known as elevator legs, and are used to elevate the grain to the top of the building, and there deposit it in large storage bins, by means of a conveyor belt.

The shipping of the grain is accomplished by drawing it off from the storage bins, by means of conveyor belts and screw conveyors, into the ground-floor hoppers, raising it to the top of the building by the elevator legs, and then allowing it to flow, by gravity, into the scale bins, where it is weighed. It then falls into shipping cars by the aid of spouts.

As stated above, cleaning is one of the functions incidental to the operation of an elevator. Cleaners and separators are usually located on the ground floor of the elevator proper, and here it is that such foreign matter as bits of wood, chaff, dirt and stones are removed from the grain.

A very important consideration in the handling of grain in all large elevators is the maintaining of a predetermined safe temperature, in order to prevent spoilage, due to high temperature effects. This is accomplished by keeping the grain in motion by means of the conveyor belts and elevator legs.

The squirrel-cage induction motor has proved itself to be the most suitable for elevator work. This is readily appreciated when we consider that all the machinery in a grain elevator runs at practically constant speed, and the atmosphere is constantly saturated with highly inflammable dust. The

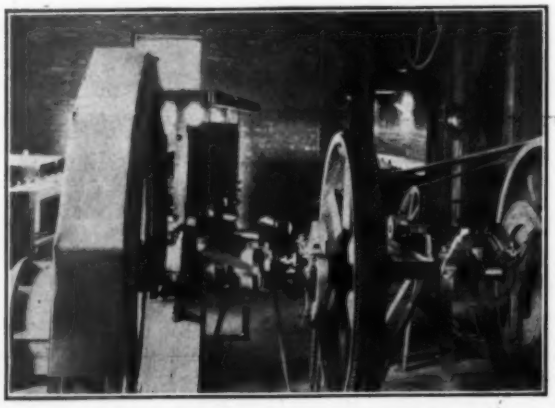


Fig. 4.—Drive for 30-Inch Conveyor Belt on Distributing Floor.

Fig. 5.—35-Horsepower Motor Driving Leg.

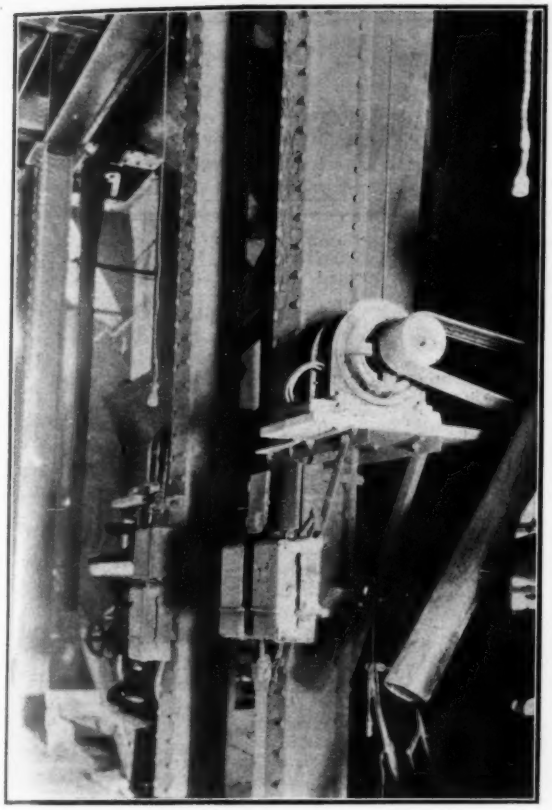


Fig. 6.—Five-Horsepower Motor Driving Barley and Wheat Separator.

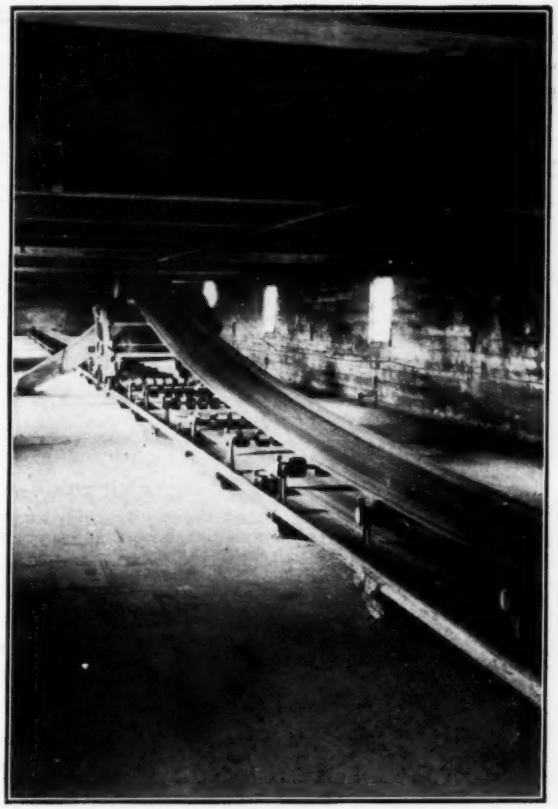


Fig. 7.—Conveyor Belt and Unloading Machine on Distributing Floor.

squirrel-cage induction motor being entirely free of any sliding contacts, eliminates all possibilities of fire, and at once commends itself for this work.

If the only power available is direct current, the motors should be of the totally inclosed type.

In the application of the electric motor to elevator machinery, the transmission is to a large extent accomplished by rope drive, due to the fact of its flexibility and its ability to transmit power in dusty locations, and without excessive slip in vertical runs.

For moving the grain from one part of the building to another, a conveyor belt is used. It is customary in all large elevators to have a conveyor belt on the top or distributing floor, by means of which the grain is transferred from the elevator workhouse to the storage tanks. This conveyor belt is so arranged that by means of a movable unloading machine the grain can be allowed to fall into any of the large storage tanks, so familiarly seen in such structures. A conveyor belt is also used for drawing off the grain from the storage tanks, when it is required for shipment, or for any other purpose. The size of the belts used ranges from twenty to forty inches in width; the speeds ranging from very low speed up to twelve hundred feet per minute. The carrying capacity is, of course, dependent upon the speed of the belt and in this connection it should be mentioned that, in order to obtain the maximum carrying capacity from belts, idle pulleys are arranged every few feet, along both sides of the belt, thus troughing the belt and allowing a much larger quantity of grain to be carried without leakage. The horsepower required to drive conveyor belts varies according to the speed, the length of run and the quantity of grain to be carried.

Fig. 8.—Three-Horsepower Motor Driving Mustard Machine.

Fig. 9.—35-Horsepower Motor Driving Unloading Leg.

Grain Elevator Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Gould Elevator Company, Minneapolis. General storage and cleaning business. Storage capacity, 18 tanks, 30,000 bushels each, and 8 small tanks, 12,000 bushels each. Grain handled is mostly barley.

This plant runs cleaning apparatus 24 hours a day and load and unload for 10 hours a day. This plant handles on the average 80 cars, in and out.

Total connected horsepower, 332.5. Total number of motors installed, 19. Average kilowatt-hours per month, 7,545.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
February	5,360	June	5,800	October	7,520
March	6,400	July	6,680	November	7,960
April	4,760	August	7,360	December	11,900
May	5,600	September	8,280	January	13,100

Load-factor, 28 per cent.

MOTOR INSTALLATION.

The following is a list of the motors with their respective drives. The supply source is three-phase, 60 cycles, 2,300 volts. Transformed on premises to 220 volts, three-phase, by three 50-kilowatt transformers.

No.	Horse-power	R. P. M.	Application.
1	3	1,700	Driving mustard machine.
1	15	1,200	Driving barley cleaner.
1	5	1,150	Driving four screening cleaners.
1	5	1,800	Driving barley and wheat separator.
1	25	1,200	Driving transfer leg, having capacity of 8,000 to 10,000 bushels per hour.
1	15	1,200	Operating shovel on south side of building.
1	10	1,200	Operating shovel on north side of building.
1	25	1,200	Running 30-inch conveyor belt in basement, 200-foot centers.
1	5	1,800	Driving twin leg having capacity of 2,000 bushels per hour.
1	7.5	1,200	Driving short leg for barley cleaner.
1	35	690	Driving leg on north side of building. This leg has a capacity of 10,000 bushels per hour. 22-inch buckets.
1	20	860	Driving two barley-cleaner legs, each leg having capacity of 5,000 bushels per hour.
1	35	690	Driving unloading leg having capacity of 10,000 bushels per hour. 22-inch buckets.
1	35	1,200	Driving shipping leg having capacity of 10,000 bushels per hour. 22-inch buckets.
1	25	1,200	Operating 30-inch conveyor belt on distributing floor, having capacity of 10,000 bushels per hour. 200-foot centers.
1	3	1,800	Humphrey cleaner.
1	20	1,200	Operating car puller.
1	15	1,200	Operating barley cleaner having a capacity of 5,000 bushels per hour.

Banner Grain Company, Minneapolis. General cleaning and storage business. Number of men employed, 4. Plant operates 10 hours per day. Storage capacity, 12 tanks, 25,000 bushels each, 75 feet high; and 5 tanks, 10,000 bushels each, 75 feet high. Grain handled is mostly wheat.

This plant handles on the average 300 cars per month, in and out.

Total connected horsepower, 85. Total number of motors, one.

Average kilowatt-hours per month, 6,258.

Kilowatt-hour consumption for following months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
April	5,180	August	5,320	December	8,960
May	980	September	8,540	January, 1914	8,680
June	1,400	October	10,640		
July	3,780	November	9,100		

Load-factor, 18 per cent; operating-time load-factor, 43 per cent.

MOTOR INSTALLATION

The following is a list of the motors with their respective drives. The supply source is three-phase, 60 cycles, 2,300 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	85	720	Belted to 40-foot shaft by 14-inch belt, driving shaft at 250 revolutions per minute. From this countershaft are driven the following: Two elevator legs, each having capacity of 5,000 bushels of wheat per hour. One 30-inch belt conveyor on distributing floor. 150-foot centers. One 26-inch conveyor belt in basement. 150-foot centers. One Monitor compound separator. One flax cleaner. One car puller. One automatic shovel. One main lift.

Grain Elevator Data—Sheet No. 2.

Merchants' Elevator Company, Minneapolis. General storage and cleaning. Mostly barley is handled. Number of men employed, 10. Storage capacity, 20 large tanks, 20,000 bushels each, and 6 small tanks, 7,000 bushels each.

Total connected horsepower, 275. Total number of motors, 8. Average kilowatt-hours per month, 32,790.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	34,320	May	16,080	September	42,000
February	34,800	June	28,320	October	48,000
March	27,360	July	30,240	November	38,758
April	15,360	August	37,440	December	40,800

Load-factor, 43 per cent.

MOTOR INSTALLATION

The following is a list of the motors with their respective drives. The supply source is three-phase, 60 cycles, 2,200 volts, transformed on premises to 220 volts, three-phase.

No.	Horse-power.	Speed R. P. M.	Application.
1	40	900	Drives line shaft to which is connected one 6-inch screw conveyor; one 12-inch screw conveyor; one 14-inch screw conveyor; one car puller; one automatic shovel; one sulphur pump. Belted motor.
1	50	900	Driving three legs, one 1,500 bushels per hour, one 2,000 bushels per hour and one 4,000 bushels per hour. Rope drive. Back-geared.
1	50	900	Driving three legs, one 1,500 bushels per hour, one 2,000 bushels per hour and one 4,000 bushels per hour; also one screening cleaner.
1	15	1,120	Driving No. 10 Invincible cleaner. Belted. Back-geared. Rope drive.
1	15	1,120	Driving large size Invincible cleaner. Belted.
1	30	1,120	Driving blower fan. Direct-connected.
1	20	1,120	Driving 36-inch conveyor belt; 300-foot centers. Back-geared.

Quinn, Sheperdson Company, Minneapolis. Elevator D. Business, general cleaning in transit. Number of men employed, six. Storage capacity, one tank, 50,000 bushels. Grain handled is mostly corn. Plant operates 24 hours per day. Average of 400 cars per month, in and out.

Total connected horsepower, 75. Total number of motors, 2. Average kilowatt-hours per month, 4544.

Kilowatt-hour consumption for following months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
May	3,500	August	2,000	November	5,100
June	3,600	September	3,660	December	7,380
July	3,420	October	4,460	January	7,120

Load-factor, 32 per cent.

MOTOR INSTALLATION.

The following is a list of the motors with their respective drives. The supply source is three-phase, 60 cycles, 2,300 volts. Transformed on premises to three-phase, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	50	850	Drives line shaft to which is connected one car puller; one shovel rigging; three cleaning machines; one No. 9 oat separator; one No. 8 flax cleaner; one 36-inch Richardson machine; one 30-inch conveyor belt. 75-foot centers.
1	25	900	Driving three legs. One having capacity of 5,000 bushels per hour and having 20 7-inch buckets. The other two each having a capacity of 1,200 bushels per hour, and having 10-by-16-inch buckets. Gear and rope drive.

TABLE I.—GIVING APPROXIMATE HORSEPOWER REQUIRED TO DRIVE WORM, CONVEYOR FOR GRAIN AND OTHER LIGHT MATERIAL.

Tons per hour	——Length of Conveyor in Feet——									
	10	20	30	40	50	60	70	80	90	100
5	0.19	0.38	0.57	0.76	0.95	1.14	1.33	1.52	1.71	1.90
10	0.38	0.76	1.14	1.52	1.90	2.28	2.66	3.04	3.42	3.80
15	0.57	1.14	1.71	2.28	2.85	3.42	3.99	4.56	5.13	5.70
20	0.76	1.52	2.28	3.04	3.80	4.56	5.32	6.08	6.84	7.60
25	0.95	1.90	2.85	3.80	4.75	5.70	6.65	7.60	8.55	9.50
30	1.14	2.28	3.42	4.56	5.70	6.84	7.98	9.12	10.26	11.40
35	1.33	2.66	3.99	5.32	6.65	7.98	9.31	10.64	11.97	13.30
40	1.52	3.04	4.56	6.08	7.60	9.12	10.64	12.16	13.68	15.20
45	1.71	3.42	5.13	6.84	8.55	10.26	11.97	13.68	15.39	17.10
50	1.90	3.80	5.70	7.60	9.50	11.40	13.30	15.20	17.10	19.00

Grain Elevator Data—Sheet No. 3.

TABLE II.—CARRYING CAPACITY OF THE STEEL GRAIN BUCKET.

Size.	12 in. apart. Speed 200 ft. per min. Bushels per hour.	12 in. apart. Speed 300 ft. per min. Bushels per hour.	12 in. apart. Speed 500 ft. per min. Bushels per hour.
5x4	250	371	625
6x4	275	412	687
7x4.5	500	637	1,062
8x5	600	900	1,500
9x5	650	1,012	1,687
10x5.5	850	1,275	2,125
11x6	1,105	1,725	2,875
12x6	1,300	1,950	3,250
14x6	1,600	2,400	4,000
20x6	2,275	3,412	5,687

TABLE III.—NUMBER OF CUBIC FEET OF MATERIAL DELIVERED IN AN HOUR BY DIFFERENT WIDTHS OF TROUGHED CONVEYING BELTS TRAVELING AT THE SPEED OF 100 FEET PER MINUTE.

750 feet per minute is not an extraordinary speed for grain-carrying belts.

Width of belt.	Capacity in cubic feet.	Capacity in bushels.	Width of belt.	Capacity in cubic feet.	Capacity in bushels.
12 in.	187	150	26 in.	880	707
14 in.	255	200	28 in.	1,020	820
16 in.	333	265	30 in.	1,170	940
18 in.	413	332	32 in.	1,333	1,117
20 in.	521	418	34 in.	1,505	1,210
22 in.	630	506	36 in.	1,687	1,355
24 in.	750	602			

TABLE IV.—SPEED OF ELEVATOR BELTS

Elevators carrying grain will discharge well if run at the speed given in table below, if the elevator head is properly constructed.

Diameter of head pulley, inches.	Revolutions per minute.	Speed of belt in feet.	Diameter of head pulley, inches.	Revolutions per minute.	Speed of belt in feet.
24	37 to 42	232 to 263	48	31 to 36	389 to 452
30	35 to 40	275 to 314	54	30 to 35	424 to 494
36	33 to 38	311 to 358	60	29 to 34	455 to 534
42	32 to 37	351 to 406	72	28 to 33	527 to 622

TABLE V.—APPROXIMATE HORSEPOWER REQUIRED TO DRIVE WORM CONVEYOR, FOR HEAVY MATERIAL.

Tons per hour.	——Length of Conveyor in Feet——									
	10	20	30	40	50	60	70	80	90	100
5	0.33	0.66	0.99	1.32	1.65	1.98	2.31	2.64	2.97	3.30
10	0.66	1.32	1.98	2.64	3.30	3.96	4.62	5.28	5.94	6.60
15	0.99	1.98	2.97	3.96	4.95	5.94	6.93	7.92	8.91	9.90
20	1.32	2.64	3.96	5.28	6.60	7.92	9.24	10.56	11.88	13.20
25	1.65	3.30	4.95	6.60	8.25	9.90	11.55	12.40	14.85	16.50
30	1.98	3.96	5.94	7.92	9.90	12.28	13.86	15.84	17.82	19.80
35	2.31	4.62	6.93	9.24	11.55	13.86	16.17	18.48	20.79	23.10
40	2.64	5.28	7.92	10.56	13.20	15.84	18.48	21.12	23.76	26.40
45	2.97	5.64	9.81	11.88	14.85	17.82	20.79	23.76	26.73	29.70
50	3.30	6.60	9.90	13.20	16.50	19.80	23.10	26.40	29.70	33.00

TABLE VI.—HORSEPOWER AND CAPACITY OF INVINCIBLE OAT CLIPPER.

Size No.	1	2	3	4	5	6	7	8	9	10
Bu. per hr.	60	90	120	160	200	400	600	800	1,200	1,500
Est. h. p.	6	7	9	9	10	12	15	25	40	48

TABLE VII.—HORSEPOWER AND CAPACITY OF DUSTLESS DOUBLE RECEIVING SEPARATOR.

Size No.	0	1	2	3	4	5	6	7	8	9	10
Bu. per hr.	50	100	200	300	500	750	1,000	1,250	1,500	1,750	2,000
Est, h. p.	2	2.5	3	4	5	6	7	8	10	12	15

TABLE VIII.—HORSEPOWER AND CAPACITY OF COMPOUND SHAKE DUSTLESS DOUBLE RECEIVING SEPARATOR.

Size No.	0	1	2	3	4	5	6	7	8	9	10
Bu. per hr.	50	100	200	300	500	750	1,000	1,250	1,500	1,750	2,000
Est. h. p.	2	3	4	5	6	7	8	10	12	15	18

An approximate formula that can be used for obtaining the power required for conveyor belts, when fully loaded is as follows: Figure 0.6 horsepower for each 100 feet run, per 1,000 bushels of wheat per hour. To this, add from 15 to 25 per cent for friction, depending on the length and speed of the belt. This figure is for horizontal runs, and proper additions must be made in the event of inclined runs.

The following formula may be used to obtain the power required by a screw conveyor: 1.5 horsepower per 100 feet of conveyor belt, per 1,000 bushels per hour. Add 25 per cent for friction losses.

Elevator legs, as mentioned above, consist of an endless belt, to which are attached buckets, the size of which depends on the amount of grain to be handled. Their function is to carry the grain from the receiving hoppers to the top of the building, from which point they can be placed in any of the storage bins, by means of movable spouts. The speeds commonly used in connection with elevator legs vary from 200 to 500 feet per minute, with the capacity ranging from 250 to 6,000 bushels per hour, depending on the spacing of the buckets, and the speed of the belt. Elevator legs are also used for supplying the various cleaners and separators, the only difference being that they are much smaller than the large legs used in unloading and shipping. Table No. 6 shows the size of head pulleys in common use on elevator head shafts, together with the revolutions per minute of head shafts, and the corresponding belt speeds in feet per minute.

It is very important that the elevator operator have some way of knowing the true condition of the grain stored, and this without useless turnings. In this connection, mention should be made of the Zeleny thermometer system, which is used in no less than a dozen elevators in the city of Minneapolis, and a large number of other elevators throughout the country. The principle employed in the Zeleny thermometer system is the thermoelectric couple, wherein an electromotive force is produced whenever two dissimilar metals are in contact, and this electromotive force changes in strength with the change in temperature.

From this, it is readily seen that, as these thermoelectric couples are placed every 5 or 10 feet throughout the various storage tanks, the elevator operator knows at all times the exact condition of the grain stored in each bin, for if there is any heating, or the least variation in temperature, it is detected instantly by simply noting the reading instrument, thus eliminating any chances of his allowing it to spoil, as well as saving the cost of turning the grain when it is not necessary.

Referring now to the accompanying views of the Gould Elevator in Minneapolis, we are presented with an excellent example of a modern elevator and the application of electric drive.

Fig. 1 shows the receiving hopper, covered with a heavy iron grating and a 15-horsepower motor for operating a pair of unloading shovels, as described in a previous paragraph. The scales are also shown in this picture for weighing all cars both in and out.

Fig. 2 shows the gear and rope drive for an elevator leg, which has proved to be the most suitable arrangement for this class of work. Fig. 2 also shows this common method of drive and shows clearly how the grain is deposited into the desired bin by means of a movable spout.

In Fig. 6 we see a good construction for mounting a motor, driving cleaning apparatus, when same is not driven from a line shaft. The starter is seen located immediately below the motor.

Fig. 7 shows the 30-inch conveyor belt, together with the unloading apparatus for placing the grain in the different tanks. As shown, this machine runs on rails and can be placed in any position desired. Fig. 4 shows the method of drive for this belt, and the 25-horsepower motor used.

It might be well to mention that the power engineer should always keep in mind the wisdom of co-operation between the manufacturer and the central station, before deciding upon a definite piece of apparatus, for there is no doubt the manufacturer being in touch with changing conditions and operating requirements of similar applications can be of valuable assistance in arriving at the most satisfactory and efficient arrangement for all concerned. In spite of the fact that electricity has brought about a new power era, it often happens that the prospective user is entirely unfamiliar with the apparatus and engineering features involved, as well as the advantages and economies which will result from its introduction. This is where co-operation will produce the greatest benefits, not only in increased commercial prosperity of the central station, but also in a betterment of the general welfare of the community.

The foregoing table contains data on the operation of six elevators located at Minneapolis, purchasing power from the local central station.

No. of elevator	Grain handled	Bushels handled per year	Class of business	Bushels per K. W. H.
1.	Mostly barley	6,100,000	Cleaning and storage	15.5
2.	Mostly barley	3,000,000	Cleaning and storage	33
3.	Mostly wheat	1,000,000	Cleaning and storage	45
4.	Mostly corn	1,250,000	Cleaning and storage	47
5.	Mostly corn	2,500,000	Cleaning and storage	41
6.	Mostly wheat	886,000	Cleaning and storage	50

Electric Club of Chicago.

At the meeting of the Electric Club of Chicago held on June 11, Arthur H. Ford, professor of electrical engineering at the University of Iowa, made an address on "The Supply of Power to Constant-Current Circuits." He first explained the characteristics of series circuits and showed how their simplicity and economy of wiring and ease of control made them practically universal in American street-lighting practice. Since these circuits are almost invariably of the constant-current type, they must include not only an automatic cutout at each lamp to maintain continuity of the circuit but they must have provision for variable voltage at the source to accommodate variation in number of lamps burning.

At first the supply of power to series lighting circuits was obtained from direct-current arc machines, but the operating troubles of these have caused their almost complete substitution by alternating-current generating equipment. Since the latter is invariably of the constant-potential type, some form of transformer is usually employed to obtain constant-current regulation. At first series transformers to whose secondaries the lighting circuits were connected, were used; these are suitable only for incandescent lighting. Constant-current transformers for either arc or incandescent circuits give the best possible regulation from full load to short-circuit, but are rather expensive in first cost. Transformers with large leakage paths give approximately constant current over a limited range and are serviceable for incandescent lighting; their power-factor is not very good, however. The fourth type is the leakage transformer with a number of potential taps. This has the advantage over the preceding type in an adjustible range of regulation and improved power-factor. It is much cheaper than the constant-current transformer and on incandescent circuits gives all the regulation usually needed. Since series arc lamps are more and more giving way to series incandescent lamps, especially tungsten lamps, the constant-current transformer will gradually be retired also, in Professor Ford's opinion, because its additional expense will seldom be warranted.

The production of coal in Alabama in 1913 was 17,678,522 short tons, valued at the mines at $23,083,724.

Commercial Practice
Management, Rates, New Business

Important Rhode Island Power Contract.

The Rhode Island Power Transmission Company, a subsidiary of the New England Power Company, has closed a contract with the Blackstone Valley Gas & Electric Company, by which the latter will purchase a large amount of hydroelectric power from the former.

The Blackstone Valley company will distribute the hydroelectric current throughout the territory which it serves in Rhode Island, the current being generated at the New England Power Company's plants on the Deerfield River and the Connecticut River Power Company's plants on the Connecticut River. The contract is similar to that made by New England Power Company with the Narragansett Power Company but with some changes due to difference in conditions in the territories of the two distributing corporations.

Except in times of low water in the rivers, when additional power may be required, the steam plants of the Blackstone Valley company will be held in reserve, but the contracts provide for an interchange of power, by which the steam plants may be used to help out the hydroelectric plants when necessary. The hydroelectric power will soon be available.

Chattanooga Sign.

The Tennessee Power Company is donating current to illuminate a large civic sign recently painted under the auspices of the Chattanooga Chamber of Commerce on a conspicuous wall in the business district of that city. The sign is 35 by 100 feet in size, and is lighted at night with a 2,000-candlepower nitrogen-filled Mazda lamp, mounted in a concentrating reflector. The reflector is installed on the roof of an adjacent building and the entire surface of the sign is brilliantly illuminated. The sign is believed to be the first of its kind ever established to advertise a city. Several concerns donated work or material so that although the completed project represents about $500, it did not cost the Chamber of Commerce anything. Proprietors of "The Electric Shop" did the wiring and electric installation. The following Chattanooga Jovians participated in the project: F. W. Hoover. L. J. Wilhoite, P. J. Kruesi and P. W. Curtis, of "The Electric Shop."

Residence-Service Campaign of the Commercial Section, N. E. L. A.

The residence-service advertising campaign, prepared by the Commercial Section of the National Electric Light Association for distribution among members, is now ready for the use of member companies. It seems that this residence-service advertising campaign fills a field that has hitherto been somewhat neglected.

The Commercial Section was organized four years ago, and has grown from a membership of less than 200 to a membership which will probably exceed 2,000 before the end of the current month. The object of the Section, as stated in its Constitution, is "To aid in every way possible the development of the central-station sale of electricity for light, heat, power and other uses." The constructive and valuable publicity work created by the Section in pursuit of this object is directly responsible for its present position as one of the most aggressive, important and powerful sections in the Association. One has only to glance over the report of the Merchandising and Advertising Committee, the Electrical Salesman's Hand Book and the new Residence Service Campaign, in order to realize how thoroughly the Commercial Section is living up to the promises implied in its Constitution.

Many central-station managers who realize today what splendid opportunities are lying neglected in the disproportionately large amount of unconnected business in their territories are pondering these three troublesome questions:

(1) "How shall I increase the efficiency of my salesmen?" (2) "What are the best advertising methods for increasing the sale of current-consuming appliances?" (3) "How shall I get my unconnected 'prospects' down to the irreducible minimum?"

No more significant indication of the tremendous value of the Commercial Section's education work can be found than in its convincing answers to these three questions, as set forth in the Salesman's Hand Book, the Report of the Merchandising and Advertising Committee, and the Residence Service Campaign.

During the last three years, in answer to a widespread demand for "business-getting" booklets, the Commercial Section has issued eight or ten booklets aggregating upwards of half a million copies, through its Publications Committee.

Only a few months ago, however, it was realized that the most pressing need of the hour among member companies was a hammer-and-tongs residence-service campaign that would enable commercial managers to keep everlastingly after their unconnected residence prospects with rapid-fire publicity matter, covering a period of at least one year. Work was at once started on the preparation of this campaign, the first edition of which is now in press.

This service comprises 13 separate pieces of advertising literature, including snappy, suggestive booklets, mailing folders, and fac-simile letters with return cards, designed to cover a maximum period of twelve months, or to be mailed twice a month if necessary, space being provided on each piece of printed matter for the imprint of the local company making use of this service. The scheme is so flexible that large companies having their own advertising departments will find that this service may be dove-tailed into their existing or prospective new-business campaign with the greatest ease and with the most gratifying results. Other companies who may lack the facilities of an advertising department, or who can hardly afford the expense of employing advertising experts to build up special campaigns, will find this residence-service campaign a wonderfully effective and inexpensive solution of one of their most difficult problems in new-business work.

It is perhaps hardly necessary to add that this material has been prepared under the supervision of some of the leading advertising managers of the central-station industry,—men who are experts in this particular line of work and whose concentrated craft and experience in the gentle art of rounding up and corralling the prospective customer have been gratuitously contributed in the preparation of this campaign. Member companies of the Association are offered this service at actual production cost plus a small percentage to cover necessary overhead expense.

CLEAN THE ELECTRIC WAY
The Expert Wireman Leaves Your House In Perfect Order
Light Lunches
Give the old Kitchen Stove a Vacation—Cook Out-of-doors in Comfort
Gifts that Please
The Electrically Equipped Home
ELECTRICITY and its uses in the modern home
The Wiring of the Home

Literature Prepared for Residence Campaign by Commercial Section, National Electric Light Association.

Louisville Tannery Changes to Central-Station Power.

Thorough satisfaction with electricity as the motive power in one department of the tannery of William Schuff & Company, in Louisville, Ky., has resulted in the decision of the company to electrify the whole plant, and that improvement will be begun at once. Some time ago the company added a cutting department to its plant, in which the tanned hides are cut into blocks. It happened that the steam power equipment then in use was not adequate to the increased requirements, so electric motors using central-station current were installed. So completely did the new power meet the requirements that electrification of the whole plant was decided on and will be done gradually. Current for all operations in this case will be obtained from the Louisville Gas & Electric Company. The Schuff Company, which has need of much hot water in its operations, will continue to use its furnaces and boilers but will discard the steam engine. In most cases the plant will be equipped on the individual-drive system and the requirements will call altogether for about 250 horsepower.

In this connection the American Oak Leather Company's Louisville plant will soon dispose of its steam-drive apparatus in favor of electricity, which it will generate, however, at its plant. Bids have been advertised for and the contract is to be let soon at the Cincinnati, O., office.

Central-Station Supply for Kentucky Coal Companies.

Central-station current is to be furnished before the end of the summer by the Kentucky Utilities Company to the coal-mining operations of the Wallings Creek Coal Company, the Clover Fork Coal Company and the Harlan Coal Mining Company, each of which has heretofore operated its own plant. The motor-generators for the mining companies will be furnished by the Westinghouse Electric & Manufacturing Company. The Kentucky Utilities Company, which has headquarters at Lexington, wil run a transmission wire into the section in which the mines are located, and it is expected, will get a lot of similar additional business.

Slogan Sign for Pittsfield.

The Pittsfield Electric Company, Pittsfield, Mass., purposes to erect a large slogan sign in that city, and has been conducting a contest to determine upon a slogan. A committee of the Board of Trade was unable to decide upon a choice out of the 400 suggestions received, so submitted four of them to a popular vote. These were: "Pittsfield—Active, Attractive;" "Pittsfield—Heart of the Berkshires;" "Our Field, Your Field, Pittsfield;" "Pittsfield—Our Town."

Two prizes, of $10 and $5 respectively, were offered to the originators of the most popular slogans.

"Safety First" Organization in Southern Indiana.

The employees of the United Gas & Electric Company, the Insull utility company which serves New Albany and Jeffersonville, Ind., and surrounding towns, are enrolled in the "Safety First" organization of the Insull properties in southern Indiana. Some 400 men altogether are members of the four divisions, one of which includes the shop men, another the train men, the third the electrical, gas and track construction men, and the fourth the other employees of the Gas & Electric Company. Heretofore the men have been loosely organized, holding quarterly meetings under the direction of the officers of the companies, but now the men are directly organized. Committees from each of the four divisions will work through a general committee, which is composed of the heads of the four organizations, and this general committee will take up recommendations and suggestions with the officials.

Brooklyn Company Signs Million-Dollar Contract.

The Edison Electric Illuminating Company of Brooklyn has signed a contract with the American Manufacturing Company, the largest maker of bagging and cordage in the world, whereby the company will discard its 5,500-horsepower isolated plant and use central-station service. The contracted load was for 4,000 kilowatts, the guarantee being for not less than 3,000 kilowatts of demand, not more than 15 per cent of which is to come upon the peak. It involves a change from direct-current motors to three-phase 25-cycle motors, and the scrapping of a $300,000 plant. The change-over will require an outlay of approximately $80,000, and the contract, which is made for a term of years, will give the Brooklyn Edison company a gross aggregate income of between $1,000,000 and $2,000,000. To secure the contract required a trip to London, where the consulting engineers of the American Manufacturing Company are located, and a change in the regular labor schedule of the concern, which employs 2,000 men in its Brooklyn mills. The consumer agreed to close during November, December, January and February at 4:30 in the afternoons instead of 5:30, making a radical change in its labor schedule to take advantage of the central-station contract, which is one of the largest covering strictly electrical service ever written.

Virginia Power Company's Plant Opened.

More than 200 bankers, coal operators and other interested business men from New York, Boston, Philadelphia, Baltimore, Cincinnati and other large cities were present last week when the Virginia Power Company's big hydro-electric power plant at Cabin Creek Junction was placed in operation. The plant has a capacity at present of 26,666 horsepower, but additional units bringing its power up to 166,000 horsepower are to be placed later. The company has strung 125 miles of copper transmission lines on steel towers carrying current to numerous mining plants in that section, at an expenditure of $3,000,000. The Cabin Creek Junction plant was opened under the supervision of Chief Engineer G. O. Lenz. The company has practically completed arrangements for another plant near Hinton, on the New River, the project depending at present on the consent of the West Virginia Public Service Commission to the construction of a dam in the stream.

Louisville Power-Plant Extension.

The addition to the water-front power station of the Louisville, Ky., Gas & Electric Company, which was begun some time ago and which will involve the expenditure of $500,000, has reached the state where it is ready for the steel work. The buildings will be of steel, concrete and brick construction and will take the place of the old offices of the Kentucky Electric Company, which was merged into the new concern. The present capacity of the plant is 5,000 kilowatts, while contracts are now outstanding for the installation of two additional 5,000-kilowatt turbines. One feature of the improvements will be the new coal bunkers which will connect with the elevated trestle of the Illinois Central Railroad in such a manner that they may be filled directly from the dump cars.

The plan of the company is eventually to generate all its electricity at the water-front plant, retiring the old plant of the old Louisville Lighting Company little by little.

Central-Station Supply for Isolated Plants in Summer.

A feature of the summer business of the Louisville Gas & Electric Company is furnishing large private plants with their current for lights and fans. The latest additions to the list this season are the Galt House and the Herman Straus & Sons Company department store in Louisville, Ky. In the winter both these concerns operate their own electric plants in connection with their heating plants.

Electric Sign Data

Electric Sign Campaign in Denver.

The Denver Gas & Electric Light Company is conducting a very effective newspaper campaign in the interest of electrical advertising. A series of newspaper advertisements are being published, calling attention to the value of electric signs as an advertising medium and reproducing illustrations of prominent Denver signs. The advertisements are three columns wide and 17 inches deep. Each carries a testimonial from the head of the concern using the electric sign pictured in the advertisement.

The following is the copy used in one of the advertisements, that referring to the Knight-Campbell Music Company's installation.

The Knight-Campbell Music Company is a confirmed believer in the trade-getting power of lights. Their new electric sign is one of the largest and brightest in the city. The perfect window illumination attracts the attention of everybody and every part of the interior is effectively illuminated. The entire lighting scheme has a powerful advertising force, because it is artistic, unique and original.

Does this kind of advertising pay? Does it give a good return on the investment? Read the firm's letter:

The Denver Gas & Electric Co.:

Gentlemen — No one who has seen our new electric sign can doubt for a moment but that the Knight-Campbell Music Company places the highest possible confidence in the business-getting qualities of electric-sign advertising.

The new sign is one of the largest in Denver, and, because of its great size and unique design, featuring as it does our trade-mark, the well known "Knight" and the "Campbell," has already gained us a great deal of beneficial publicity.

Our specially designed window and store lighting is another source of direct profit to us. So effective is this illumination that a person passing in front of our store can readily see the most delicate blending of colors in the woodwork of our fine pianos and victrolas. Very truly yours,

---

Current at the rate of $600 a year will be required to operate the big electric sign which will be erected in front of the Vienna Bakery & Restaurant in Louisville, Ky. The sign, which is to be a vertical one, will measure 35 feet in height, will have a double face and will burn 558 five-watt lamps. There will be numerous special flashing features and 32 special different color combinations will be displayed every minute the sign is in operation. The Greenwood Sign Company, of Knoxville, Tenn., is building the sign and the Miller Sign Company, of Louisville, will hang it.

The Union Pacific railroad system is planning to erect two large electric signs in Salt Lake City, Utah. One of them will be placed on the top of the Oregon Short Line Union Station and will cover the entire space on the roof. It will contain the words "Union Pacific System" and the trade-mark of the railroad, together with an ornamental border. The second sign will be placed over the freight house in the yards. It will contain the words "Union Pacific System" and a reproduction of a locomotive.

Contracts for the first two Kaleidoscope electric signs in Louisville, Ky., have just been closed with the Bensinger Outfitting Company, a house-furnishing concern on Market Street near Fourth, and the Vienna Bakery & Restaurant, on Fourth Street, north of Market. The signs will be put up by the Greenwood Advertising Company, of Knoxville, Tenn., while the current will be supplied by the Louisville Gas & Electric Company, the representatives of which are credited with having landed the contracts. Both of the signs will be vertical affairs, to hang in front of the houses and over the sidewalks. Each will take 500 five-watt lamps.

The Trumbull Public Service Company at Warren, O., has recently erected a "Do It Electrically" sign in front of its office. It is a vertical sign, the height of the building, operating on a flasher. The building in which the company's new office appears, has been called the Electric Block, and an electric sign, 4-foot letters, reading "Electric Block," has been installed on the roof.

An interesting incident of the big sign campaign which is being carried on by the Toledo (Ohio) Railways & Light Company is the sale of a good size display to the Toledo Public Library. This is a sign bearing the single word "Library" and makes just one more step in the universal adoption of the sign that is always on duty by night as well as day.

Sign sketch contributed by the Greenwood Advertising Company, Knoxville, Tenn.

Dimensions of sign are 9 feet by 2.5 feet. The letters are 16-inch raised, plain block type. Background of sign is glass smalt.

Receptacles are provided for 84 five-watt lamps and any flasher effect desired can be obtained. Sign is double faced.

Approximate price, $70.

Electrical Construction

ELECTRICAL INSTALLATION IN HOTEL GIBSON.—I.

Details of Power Plant.

This article describes the electrical installation of a large modern hotel. This, the first installment, describes the details of the power plant and power apparatus. The second installment will describe the methods employed in wire-shafts and floor-circuit construction.

The modern hotel stands in strong contrast to the large hotels of a decade ago. The travelling public demands the most modern conveniences—conveniences which necessitate the building of hotels that are in themselves almost equivalent to a small city in that under one roof must be contained a complete power plant for heating purposes and often for lighting purposes, a complete refrigerating plant, a water-supply installation, a laundry, a repair room, a complete telephone exchange, a clock system, a fire-alarm system, elevators, dumbwaiters, etc. In addition to these modern conveniences many of the larger hotels contain a number of large assembly rooms, a stage and numerous stores. All of these innovations have been rendered possible by the advances made in the various sciences during the period mentioned. Among these sciences that of electricity holds a prominent place, in that the modern hotel would be an impossibility without its use. The electric-wiring installation of a modern hotel is hence one of no mean proportions, as the applications of electricity in such a hotel are numerous and of varied nature.

This article is devoted to the electric installation in the new Hotel Gibson, Cincinnati, O. This is a twelve-story building with two basements and an attic. In the sub-basement is installed a complete isolated generating plant and a service connection with the mains of the City Gas and Electric Company, of Cincinnati. In this basement are located many of the power applications, all of which are supplied with 220-volt direct current.

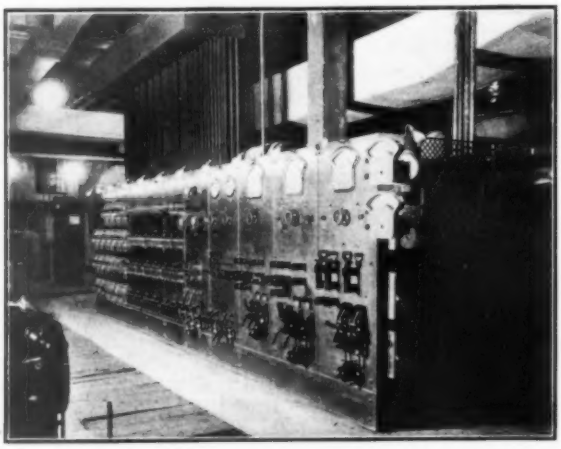


Fig. 1.—Front of Main Switchboard.

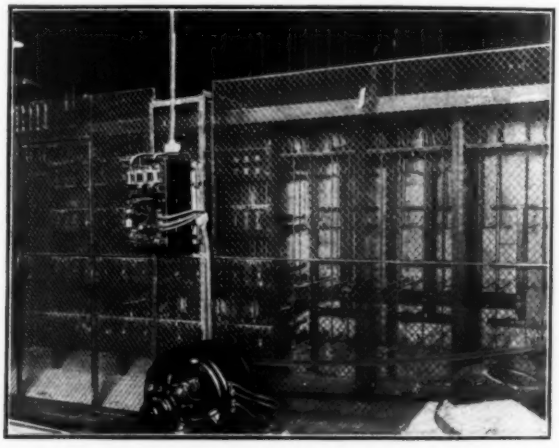


Fig. 2.—Rear of Main Switchboard.

Among the motor installations, that of the ventilating equipment is prominent. This ventilating system, which was designed by Bert L. Baldwin & Company, supplies purified and cooled air to the engine room, boiler room, barber shop, billiard room, grill room, banquet halls, private dining rooms and first and mezzanine floors. The ventilating ducts on the ceiling of the engine room are well insulated so as to prevent a reduction of temperature of the air passing through the ducts. Three separate sets of ventilating apparatus are employed, each of them having a 10-horsepower motor-driven fan and a motor-driven circulating water pump for the water span which cools and cleanses the air. When desirable this water is ice-cooled in order to cool the air in the ventilating ducts.

The bed rooms and baths are ventilated by means of vertical flues, with large motor-driven fans located in the attic.

In the basement are located two 20-horsepower Fairbanks-Morse motors driving house pumps through triplex gears, a 12.5-horsepower and a two-horsepower Triumph motor driving brine pumps, a five-horsepower Robbins and Myers motor belted to line shafting driving ice-cutting, ice-chopping and ice-cubing machines, two five-horsepower Crocker Wheeler motors driving a sewage-disposal plant, and various miscellaneous motors. Cutler-Hammer controllers and control panels are used for controlling all motors. The master clock of an extensive electrically controlled clock system is also located in the basement. This clock is in an air-cooled and air-tight case. Among the other power installations are four passenger elevators, two freight elevators, one baggage elevator, two automatic dumbwaiters, motor-driven laundry machinery and numerous fans.

Bert L. Baldwin & Company, Cincinnati, O., were the engineers and A. S. Schulman, Chicago, Ill., had the contract for entire electrical installation.

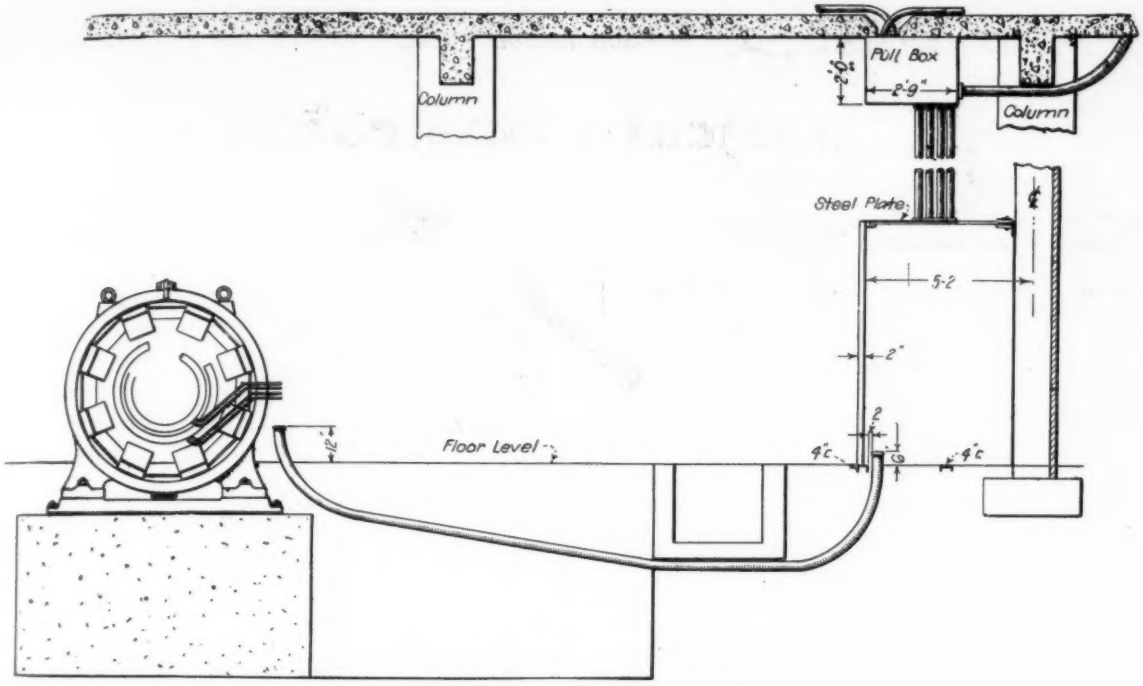


Fig. 3.—Generator, Switchboard and Pull-Box Layout.

Power Plant and Switchboard Wiring.

The power plant consists of one 200-kilowatt generator and two 250-kilowatt direct-current generators, manufactured by the Triumph Electric Company, Cincinnati, O. These generators are direct-connected to Hamilton high-speed Corliss engines. All of these generators are wound for 250 volts, two Triumph 25-kilowatt motor-generator sets being employed to deliver about 125 volts to the three-wire lighting circuits. These balancers are also used when central-station energy is employed, in that the service connection is made to the 250-volt power mains of the local central-station company.

Fig. 3 shows the generator, switchboard and pull-box layout in the sub-basement. Three 800,000-circular-mil cables each in a 2.5-inch conduit and one No. 10 wire in a 0.75-inch conduit are run in the manner shown from the generator to the switchboard. The switchboard is mounted on 4-inch channel irons and has a three-sixteenth-inch steel plate mounted as shown between the top of the board and the columns. This plate is employed to fasten the ends of the conduits leading to the pull-box situated on the ceiling above the board. For this purpose lock nuts on the top side of the steel plate and bushings at the bottom side of the plate are employed. From the pull-box conduits are run as shown and as will be described later.

Figs. 4 and 5 show the construction employed in the rear of the switchboard. Fig. 9 shows the construction employed for the lighting panels. A 2-by-1.5-by-3/16-inch angle-iron frame is employed as a support for the circuits in back of the board. The three bus bars for the three-wire lighting service are placed near the board and slightly below the center. These buses are connected by copper rods to the points of three-pole knife switches on the panels. The knife blades of these switches are connected through three parellel connecting rods *A* to three fuses mounted on a slab of slate fastened several feet to the rear of the board. From each of the three fuses for a circuit, copper rods are run in a

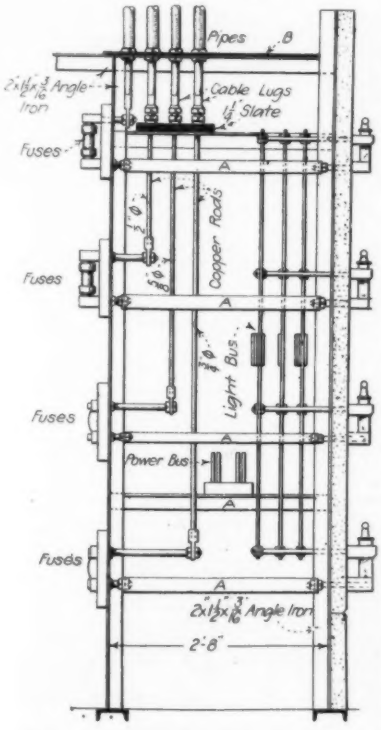


Fig. 4.—Section of Lighting Panel.

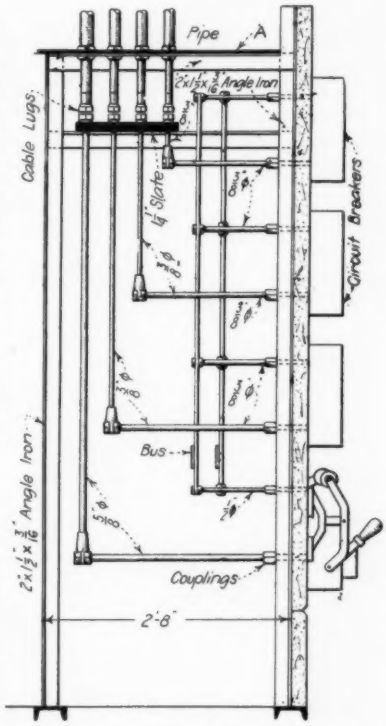


Fig. 5.—Section of Power Panel.

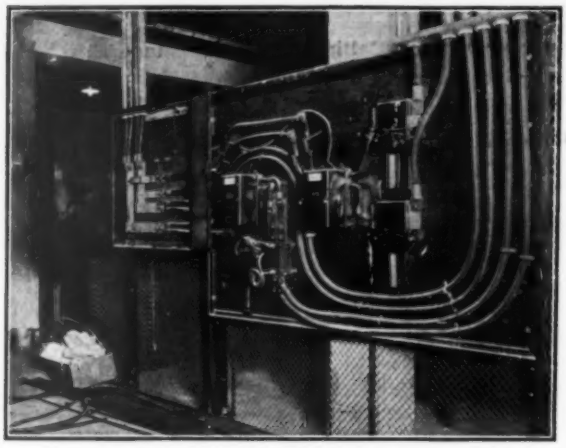


Fig. 6.—Service Metering Board.

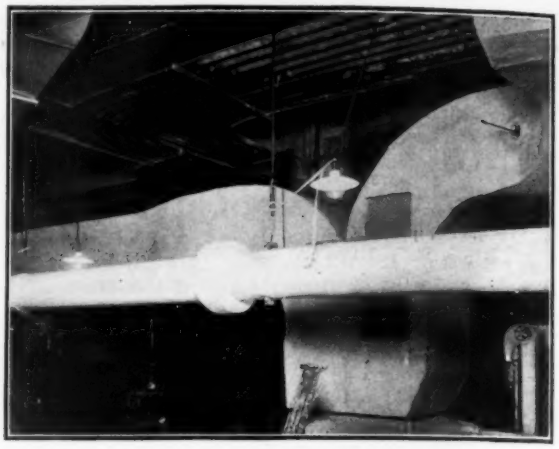


Fig. 7.—Conduit Supports in Power Plant.

vertical direction to a horizontal slate slab near the top of the board where they are connected to their respective cables by means of cable lugs. The three cables for any one circuit enter the proper line of conduit at the level of the horizontal steel plate *B*, previously mentioned.

Fig. 5 shows the construction employed in the rear of the 250-volt power panels. The two power busbars are located about three feet from the floor level as shown. As circuit-breakers and not fuses are used to protect each power circuit, the construction differs from that employed for the lighting panels. The circuit-breakers are mounted on the front of the boards as shown and copper rods and couplings are used to connect the terminals of these circuit-breakers to the buses and to the cable lugs which make the final connection to the distributing cables just before they enter the conduit pipes.

By using this construction for the rear of the switchboard, uniformity of appearance, simplicity of layout, good mechanical strength of connection, and excellent accessibility to all parts are obtained.

Figs. 1 and 2 show front and rear views respectively of this switchboard. In Fig. 2, which is a photograph taken through the wire netting used to inclose the passageway in the rear of the switchboard, the arrangement of the slate slabs holding the fuses for the lighting circuits and the arrangement of the buses and connecting rods can be seen.

Fig. 1 is a front view of the switchboard furnished by the Frank Adam Electric Company, St. Louis, Mo. The two panels to the left are devoted to power distribution, each circuit being provided with a two-pole circuit-breaker of time-limit type. These circuit-breakers were manufactured by the Condit Electric Manufacturing Company. The circuit-breakers vary in capacity from 80 to 300 amperes, the higher capacity circuits being carried to the bottom of the board. The next

Fig. 8.—Balance Sets.

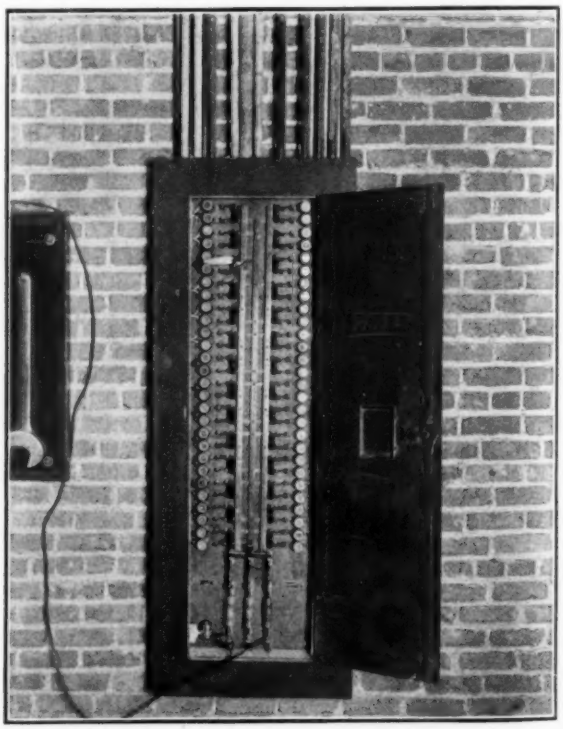


Fig. 9.—Power-Plant Lighting Cabinet.

three panels from the left are devoted to three-wire lighting-circuit distribution, the circuit switches varying in capacity from 200 to 400 amperes and the same arrangement of circuits on the panels as regards capacity being followed as in the case of the power circuits. The next panel is a totalizing panel, equipped with a three-pole 1,000-ampere circuit-breaker, a two-pole 1,500-ampere tie switch, a voltmeter plug receptacle, two Sangamo recording watt meters, and a 2,500-ampere ammeter. The next panel controls the two balancer sets; a circuit-breaker, a two-pole switch, a rheostat and a 200-0-200 ammeter being provided for each balancer set. The next three panels control the three generators, each panel having a circuit-breaker, a main-line switch, a field switch, a rheostat, voltmeter switch, and an ammeter. At the extreme right of the board are located bracket-type voltmeters, and to the side, Bristol-type recording voltmeters and ammeters. All other meters are of the Weston type.

Fig. 6 shows a view of the metering panel for the central-station emergency supply service. To the left is seen the service fuse cabinet of steel. Four 800,000-circular-mill cables each in a four-inch conduit carry the central-station service to the cabinet where the circuit is divided, one branch leading to the power meters and power circuits and the other to the lighting meters and lighting circuits. The two lower fuses in the cabinet are each connected to two 800,000-circular-mil flexible cables. A two-wire Duncan power meter is inserted in the circuit of lower set of cables as is also a 1,200-ampere shunt connected to a General-Electric Wright demand indicator. The remaining voltage terminal of the Duncan power meter is connected to the upper of the two power terminals in the cabinet. Four four-inch conduits each containing a 800,000-circular-mil cable lead to the main switchboard.

The lighting service is obtained from the two upper terminals of the cabinet, one 800,000-circular-mil cable being used for each of the two sides to a three-wire Duncan light meter mounted on the board, the voltage terminal of the meter being connected to neutral bus in back of the main switchboard by a wire run in a one-half-inch conduit shown to the right of the four service conduits entering the service cabinet. From the Duncan light meter the cables are run to two four-inch conduits leading to the main switchboard, a 600-ampere General-Electric Wright demand meter being inserted in each of the two cables.

This meter board is of 1.5-inch white-pine wood and is mounted against the wire netting inclosing the passageway in back of the main switchboard. This board is painted with asphaltum paint and the cables are mounted to it by means of U straps. The conduits after leaving this board are carried to the main switchboard, the pipes being bent in the form of an arc as they pass from one board to another, thus rendering no couplings necessary.

Two 25-kilowatt 125-volt Triumph generators each direct-connected to a 25-horsepower 250-volt Triumph motor are used as balancer sets to maintain the neutral of the three-wire lighting system when either private-plant or purchased power is used. These balancer sets are located to one side of the switchboard and are connected to it by means of conduit run underneath the engine-room floor. This conduit is brought up to the balancers sets which are mounted on concrete bases as shown in Fig. 8. The conduits pass through the bases and a coupling is inserted in each pipe a short distance above the base, where the conduit is made to follow a line parallel to the outline of the machine. When near the terminal board of the machine, the cables leave the pipes and are attached to the terminals by lugs.

This figure also shows the master electric clock, which is enclosed in an air tight case with temperature regulating means.

A somewhat similar construction is used for the various motors, controllers, etc. Fig. 2 shows that in such cases the wire leaves the conduit through a porcelain bushing and where the wires are liable to come into contact with metal parts, they are inserted in the circular loom.

Where conduits are run exposed, they are supported from the ceiling by an iron pipe hung by means of perforated iron strap as shown in Fig. 7. Throughout the basement exposed conduit work is employed, and sheet iron cabinets are used. For lighting service these cabinets are provided with inclosed fuses in the main circuits and double-pole switches and plug fuses for the branch circuits as shown in Fig. 9.

Details of the wire shafts and distribution circuits will be given in following installment.

(To be continued)

Duties on Electrical Supplies.

A statement of the rates of duty on storage batteries, cells, and carbons in a number of foreign countries, recently compiled by the Bureau of Foreign and Domestic Commerce, Washington, D. C., has been forwarded to manufacturers of the articles covered by the statement listed with the bureau. A few additional copies are available for distribution on request.

Selling More Appliances—A Suggestion.

In spite of the increasing uses of electricity it is obvious that people are not making enough of the benefits of these uses. The writer has observed that the same man who will pay $1,500 for an automobile or $125 for a graphophone outfit is the very one who will shy at $85 for a washing machine or even $5 for a combination portable light. There seems to be a prejudice against the use of electrical heating devices by some, who contrast the terrible expense to the economy of their supposed benefactor, gas. One of the fundamental reasons appears to be that the electrical industries have not yet quite caught the right little twist to make the use of electrical utilities and luxuries popular.

The automobile industry owes its existence largely to this popular notion that it is quite the style and a sure sign of prosperity as well as fashionable merit to own an automobile. There really is no reason why electrical luxuries should not be "just the ragiest thing," except perhaps that distributors of such profitable goods are not getting at the right class of customers, the great middle class, some of whom will mortgage a home to experience the joys of a buzz-wagon, while others skimp on a dinner in order to take in the movies.

Of course John Thompson Jones, who gets his $30 per, will not pay out $85 for a washing machine and he will tell you most honestly that he cannot afford to spend $125 for putting electrical wiring and fixtures in the bungalow, because thanks to 42 cent eggs and other salary consumers, he never has a surplus, much less a bank roll to blow on electrical luxuries. He will do with carbon lamps rather than spend $6.00 for a set of tungstens, if his place is already wired, yet he smokes three-for cigars, enjoys his blankola music, has as good furniture as the bank president, and perhaps owns a diamond or two.

The point is this. Distributors by adopting the sales methods of furniture, jewelry, and phonograph houses, first-class houses who keep up with the times by selling on an easy-payment plan without red tape, can very likely reach this middle class with surprising results. An average electrical dealer would probably blow up if one were to say that it would be a good plan to advertise wiring and electrical goods on such a plan; "perishable value once installed" and all of that. Still, when a house-furnisher can operate a full year with a credit loss of only a fraction of one per cent, and a jeweler can operate with a loss of 1.2 per cent,[1] there is much in such a plan that can well be considered by every concern selling things electrical for home use. Finally,

1 Some run up to four per cent just as some electrical dealers make no real money while others clean up a good sum.

it should be remembered that such concerns can do the usual cash business anyhow, the credit trade forming a sort of balance to fill in between the peaks of trade.

Future advertising and lowering of prices will doubtless alter this matter, but when every home has its electrical service and complete conveniences, when every farm has its electrical comforts, it seems certain that such a condition will have been attained largely through either or both of the means set forth, namely, "Jones has it, so must I," or "I can get it now and pay later." Perhaps all who have meritorius goods requiring some little initial outlay might well bear these two points in mind oftener.

Philip E. Edelman.

Inspection Trouble in Hutchinson.

Last spring the Board of Commissioners of Hutchinson, Kans., decided to enforce municipal inspection of electrical work, and appointed C. C. Barnes as electrical inspector on May 1. Mr. Barnes promptly started ferreting out departures from the Code, and developed an eye too keen to suit some of the wiremen of that town, who started a movement to replace him with a more obliging critic of their work. Charges of incompetence were filed against Mr. Barnes, but these were not sustained, and at a formal hearing the Board of Commissioners unanimously acquitted him and ordered him to continue rigid inspection. The commissioners concluded that the trouble was due to opposition to the inspection ordinance.

More Inspection in Kentucky.

The Kentucky Actuarial Bureau has recently established a branch of its electrical inspection department at Owensboro, Ky., with D. T. Wadsworth in charge. This is the third branch office of the kind in the state, the other two being at Lexington and Covington.

Missouri Contractors to Meet.

The annual convention of the Missouri Electrical Contractors' Association, scheduled to be held at St. Louis, Mo., on July 13, will be held on July 11 instead. Officers of the organization, after correspondence, decided that July 11, which falls on Saturday, is preferable to holding the meeting on Monday. Secretary A. J. Burns, of Kansas City, Mo., is in charge of the program and will shortly have it ready for announcement.

Electrical Contractors' Association of Westchester County.

The leading electrical contractors in Westchester County, N. Y., which includes Yonkers, Mt. Vernon, Portchester, New Rochelle, White Plains, Ossining and Tarrytown have organized the Electrical Contractors' Association of Westchester County. The officers are: president, W. N. Barlow, Yonkers; first vice-president, F. E. Schmidt, Mt. Vernon; second vice-president, I. W. Austin, White Plains; secretary, C. E. Youmans, Yonkers; treasurer, Charles A. Sillery, Yonkers.

Among the Contractors.

The Bushong Electrical Company, of Ottawa, Kans., has secured the contract for a $25,000 electric light plant at Wellsville, Kans., and will begin work at once.

Fred L. Kahn, who for the past year has been associated with the National Electric Company, of Baltimore, has severed his connection with that firm and has joined the Blumenthal-Kahn Electric Company, 505 North Eutaw Street in the same city. Mr. Kahn's brother is a member of the latter firm.

The firm of Wilson-Maltman, of Baltimore, Md., has secured the contract for the electrical installation in a coke-producing plant at Sparrows Point, Md., a suburb of Baltimore. The plant is being erected by the H. Koppers Company, of Chicago. This contract calls for installation of a large number of lights, also wiring for a total of 2,009 horsepower in electric motors. The amount of this contract is approximately $12,000. The same firm has been awarded the contract for the electrical installation in the Machinery Hall building for the Johns Hopkins University, Baltimore, the contract price being in the neighborhood of $20,000. Charles L. Reeder and Dr. John B. Whitehead are the associate consulting engineers.

The Blumenthal-Kahn Electric Company, Baltimore, Md., has been awarded the contract for the electrical installation in the warehouse for the Baltimore Bargain House, which will be nine stories in height. About 85,000 feet of one-half inch galvanized conduit will be used. Trumbull switches and panelboards will also be used. Henry Adams is the consulting engineer. The contract price on this installation is about $15,000.

The Beattie Electrical Company, of Toledo, O., has secured the contract for the electrical wiring in the new Cherry Street School at its bid of $1,754.

The National Electric Company, of Baltimore, Md., has been awarded the contract for the electrical installation in the new home for the B. P. O. E., which is to built on Fayette Street in Baltimore. James Posey is the consulting engineer. The specifications call for a complete electrical equipment for lighting, bells, annunciators and fire-alarm system. The amount of the contract is $4,250.

Harry B. Handly, Jr., formerly of Eugene I. Rosenfeld & Company, has severed his connections with that firm and has become associated with the National Electric Company, 613 East Lombard Street, Baltimore, Md.

The Standard Electrical Company, of Baltimore, Md., has been awarded the contract for the electrical work in the Baltimore ice-cream factory of William Hofferbert. This calls for an installation of 65 horsepower in electric motors.

The Durling Electric Company, of Baltimore, Md., has been awarded the contract for the electric installation in the new factory building for Strouse & Brother. Martin Schwab, of Chicago, is the consulting engineer; the contract price is about $8,500.

Freeman-Sweet Company, prominent contracting electrical engineers of Chicago, Ill., are preparing to remove from their offices in the Morton Building to Rooms 225-231, Transportation Building 608 South Dearborn Street. The company is also equipping a large store on the first floor of the building where they intend to engage in a general retail supply business.

The C. A. Bush Company of Chicago, Ill., has the contract for installing seven motors aggregating 200 horsepower in the plant of the Cargin Elevator Company, 1858 Laramie Avenue, Chicago, Ill.

Henry Newgard & Company, Chicago, Ill., has been awarded the contract for the electrical equipment involved in installing 60 lamps and ten motors aggregating 202 horsepower in the plant of the Grawoig Ice Company, 1018 South Hamilton Avenue, Chicago.

The Thomas Electric Company, Chicago, Ill., has the contract for installing 50 lamps and fan motors totalling 100 horsepower in the plant of G. A. Fuller Company, 115 South La Salle Street, Chicago, Ill.

During 1913 the Appalachian oil field, embracing New York, Pennsylvania, West Virginia, southeastern Ohio, and Kentucky, showed a slight decline—1.72 per cent—in the production of petroleum, falling from 26,338,516 barrels in 1912 to 25,885,640 barrels in 1913. The value was $63,619,677.

Convention of Oregon Contractors.

The second annual convention of the Oregon Electrical Contractors' Association was held at Portland, Ore., on June 8 and 9. The first session was called to order on Monday morning in the Pittock Block by J. E. Werlein.

In opening the convention Mr. Werlein stated that if the members present at this convention derived as much benefit and entertainment as they did at the last convention their time would not be spent in vain.

Mr. Werlein then introduced the mayor of the City of Portland, who, he stated, would have a few words to speak for the City of Portland.

Mr. Albee, the mayor stated that he could see from the twinkle in the eyes of the men assembled that there was something doing. He stated that he lives in peace and quiet at all times and that nothing can spoil the smooth sea upon which he sails. He stated that we little realized what a wonderful work is being done along the electrical line, and what great things have transpired due to the efforts of men so engaged. Commenting upon the great future of the electrical industry reminded him of the story of a bookkeeper who had been working about ten days straightening out his trial balance. He went to bed in a very troubled state of mind and one night had a dream. He dreamt that the men working electrically had provided his place of business with buttons along the desk. The buttons were labelled "Trial Balance," "Balance on Hand," etc. When the manager wanted any information all the bookkeeper had to do was to press the button and the correct figures were at hand. Everything worked well with the bookkeeper until the end of the month, when the office manager told the bookkeeper that he could dispense with the bookkeeper's services, inasmuch as the office boy could do the pressing of the buttons.

He remarked that the City of Portland was taking note of their work and that it congratulated them on the wonderful work they were doing. He wished to extend the hand of fellowship and to impress upon their minds the fact that the city's welcome is hearty and sincere.

It was then duly moved and seconded that the mayor, Mr. Albee, be made an honorary member of the Oregon Electrical Contractors' Association. The motion was unanimously carried and he was thereupon asked by the chairman to be escorted to a seat as a member of the Association.

Mr. Werlein then stated that it would be well for the mayor to remain and hear the words of welcome of R. G. Littler.

Mr. Littler, the president of the Oregon Electrical Contractors' Association, being thereupon introduced by Mr. Werlein as the next speaker, stated that he was sure all members present appreciated the encouraging and kind words of Mayor Albee, and he thanked Mr. Albee for being present. Mr. Littler stated that the Oregon Electrical Contractors' Association now had practically 40 members, that the Association was close to the jobbers and that it was doing good work. During the past year it lost two of its members by death, George Ormsby and Charles Potter.

Mr. Littler then commented upon the great importance of the campaign for a state license law as to contractors in the electrical line. He stated that today there were a great many curbstone contractors who prey upon the public, collect 80 or 90 per cent of their money, and often never turn up to finish their work. Generally such a contractor has nothing to bind him. An ordinance in the City of Portland covers the deriliction of such irresponsible contractors, which ordinance requires that a bond be filed by each contractor with the City of Portland. This ordinance, however, should be further enforced by the passage of a state license law. An effort, he said, was made to have a state license law for contractors passed at the last session of the State Legislature but it was unsuccessful. He stated that it met opposition from the labor union, which, he thought, was ill advised in the matter; also that its defeat in the last Legislature was due to a confusion of its purpose and of the issues at stake, but that the merits of a state license law, both as to the public and as to the contractors, could not be assailed. He then quoted from figures of Joseph Fowler, of Tennessee, showing the immediate benefits of a state license law in that state. Prior to its passage there were in the City of Memphis about 75 different persons who were engaged in electrical contracting, Memphis being a city of about 110,000 people. Since the passage of the state license law in that state the number of contractors has been reduced in Memphis to about 30, or about one contractor to every six or seven thousand residents. In Portland there is one electrical contractor to every 2,200 residents. There are state license laws for a great number of trades and professions but apparently the electrical contractors have been left to shift for themselves. He stated that faulty wiring in wooden buildings has been the cause of many fires and that there should be laws to protect the public in the installation of this faulty work. A state license law would guarantee that first-class work would be done and would greatly increase desirability of credit risks which jobbers have to carry.

After thanking all those that have worked with him during the past year, he said that he felt that the Association had done a great deal of work and is growing. He stated that the Association wanted only as members those who are competent, capable contractors. He felt that the Association has so far a good, clean membership and that it was accomplishing much good.

Mr. Werlein then stated that he wanted to impress upon the minds of the members of the convention that the slogan of the convention is "DO IT ELECTRICALLY," and that this slogan would especially be emphasized at the Ball Park, where "Doing it Electrically" would be electrically emphasized in the publicity it would get. The city, he said, should be startled by this one slogan: "Do it Electrically."

Mr. Werlein thereupon handed the gavel, which he described as a great historic relic, to President Littler.

Mr. Littler then read a letter from Mr. Barnes, of Troy, N. Y., in which he asked that the president extend to every one present his personal regards. He stated that he hoped soon to grasp the hand of each member.

Being called upon by the president to speak, G. W. Baker, manager of the Rose Festival Carnival Committee, spoke enthusiastically of the approaching rose carnival, saying that the Carnival Committee hoped to give the people something just a little different from what has been offered in the past.

President Littler then stated that he had a paper written by G. W. Hill, special representative of the National Electrical Contractors' Association, which he believed the members would be glad to hear.

Mr. Hill's communication stated that no business can rise to any height without co-operation, association and education. Electrical contractors are poorly paid, but there has been a great improvement in the last ten years. He referred to the infancy of electrical development, the improvements in the art, the need of eliminating bad practises, etc.

Mr. Littler then read a letter from Ernest Freeman, president of the National Electrical Contractors' Association.

A paper entitled "The Electrical Jobbers" was then read by Ross Hartley, of Portland, manager of the Pacific States Electric Company.

This was followed by a communication from J. M. Wakeman, manager of the Society for Electrical Development, explaining the work of that or-

ganization. It was read by J. R. Tomlinson.

Mr. Underwood, treasurer of Failing McCalman Company, then made an address which was illustrated with lantern slides.

Mr. Underwood preluded his address by stating that he wanted to call the attention of the members to one very important feature in the electrical business which keeps cropping out and the lack of observance of which is the cause of most trouble. It is the desire to do business in a business-like way and the ability to figure correctly on jobs. There would be less fires and less falldowns on jobs, he said, if all contractors were held down to these two things.

He stated he would not tell the members anything they did not already know about the electrical business, because that was not his business, but that he would talk on fire insurance and protection. He regretted that so few people failed to inspect closely their fire-insurance policies, as so often the policy contained representations or conditions which the holder did not live up to. He emphasized the necessity of cleaning up. Many pictures of the surroundings of business houses and residences in Portland and in many towns of Oregon were shown, the object being to call attention to the many piles of rubbish, stacks of boxes and other matter of a combustible nature which so often lie close to some building that could be easily started to burn by someone simply dropping a match or cigarette, or a spark dropping on some of such rubbish.

He stated that if he ever built a house it would not have wooden shingles and that all of the electric wires would be placed inside of conduits.

Insurance companies, he stated, should not insure bad risks, because it was a hazard to good insurance. If insurance companies would not insure bad risks, he said, the fire traps would soon be torn down. Philadelphia has the best fire escapes in the world, and there are many, many fire escapes in every city that are supposed to be life protectors but they are instead life incinerators in case of fire, being improperly constructed. The Philadelphia fire-proof tower fire escape is a model to copy after.

Business Meeting.

The business meeting was called to order by President Littler at 1:30 p. m., with a good proportion of the State membership present. Many matters of interest to members were brought up and discussed and considerable time was given to the discussion of a proposed state license law which will be introduced at the next meeting of the Oregon Legislature. The Association has a commission working upon a redraft of the proposed license law, which will soon be perfected, and the complete proposed law will then be submitted to different organizations throughout the state for their approval and support.

The proposition of amalgamating the State Association and the Portland Electrical Contractors' Association also was brought up by the secretary, F. C. Green, and the president appointed a committee consisting of Mr. Green and Mr. Tomlinson to look into this matter and report at the next regular meeting. By combining the two associations it is hoped to give members in the outside towns in the state more complete data of the proceedings of meetings, resulting in greater benefits to them from the organization.

The matter of the director's expense to the National Association convention was brought up and discussed and a letter from the California Association's secretary, W. S. Hambridge, was read. The meeting took no action upon this matter except to approve the action of the National Association's Executive Committee, which allows the maximum expense of $100 for each director. The Association elected J. R. Tomlinson to be the next director representing the State of Oregon in the National Convention; also to go to Detroit to attend the national convention in July.

The Association also voted to request the National Association to send its special representative, George W. Hill, to the Coast, as his assistance is needed in increasing membership and reviving the Association spirit.

The election of officers was postponed on account of the proposed amalgamation of the state and city associations. The meeting was closed at 3:30 p. m. and all attending the convention were then escorted to special cars and taken to Council Crest, one of the city's finest pleasure resorts.

In the evening, at 7:30, both ladies and gentlemen were escorted aboard the river steamer Ione and were taken for a pleasant ride up and down the Willamette River. This proved to be one of the most pleasant entertainments of the convention. All enjoyed themselves and were entertained with dancing, singing, etc. The "Ginger City Band," furnished by Robert Skeen, added to the pleasures and fun of this occasion in their make-ups representing country rubes, etc.

At 9:30 a. m. on Tuesday, June 9, the convention was taken on a tour of inspection of the plant of the Northwestern Electric Company, which is located in the sub-basement of the Pittock Block. This plant is tied in with a plant on the east side of the river, which in turn is fed by the high-tension line from the plant on the White Salmon River, at White Salmon, Wash., and acts both as an auxiliary electric light and power plant and also distributes steam heat throughout the city. The members of the Association displayed great interest in this modern installation and were greatly pleased to have been able to see the equipment and have it explained to them by the engineers of the Northwestern Electric Company.

From this place the crowd was taken in automobiles to the electric lighting-fixture factory of J. C. English & Company, in East Portland. This is a new factory, just completed by Mr. English, and the details were interesting to those in the fixture business. The plant is efficiently laid out and thoroughly capable of taking care of a rapidly increasing business. The crowd was then taken from Mr. English's factory to inspect the East Side station of the Portland Railway Light & Power Company, known as Station "L." This plant is an auxiliary to the Portland Railway Light & Power Company's station, principally as a street-railway service plant.

In the afternoon the crowd was taken by automobiles for a parade through the streets of Portland, which were at this time gayly decorated for the Rose Festival and filled with festival crowds. Each of the 18 machines in the parade was not only equipped with a banner of the Oregon Electrical Contractors' Association, but was equipped with a 12-inch gong and a Klaxon horn, and the noise made was terrific. The machines then proceeded to the ball grounds of the Pacific Coast League and saw the game of Portland versus Oakland.

In the evening, at 8:30, the members and ladies assembled in the main dining room of the Portland Hotel for the annual banquet, which was the closing event of the Association's meeting. J. E. Werlein presided as toastmaster, and the main speaker of the evening was Franklin T. Griffith, president of the Portland Railway Light & Power Company. Mr. Griffith's talk was along the lines of both business and pleasure, which he made most interesting to all those present.

R. C. Littler, president of the Association, made a short talk and expressed the appreciation of the membership for the kind co-operation and many courtesies which had been extended to the members in making the convention a success. A number of entertaining features were provided which were thoroughly enjoyed by those present. There were about two hundred people, ladies and gentlemen, present, and the banquet and entertainment as a whole were thoroughly enjoyed.

Public Service Commissions

Conducted by William J. Norton

ILLINOIS.

The Commercial Telephone and Telegraph Company applied to the Commission for an order restraining certain individuals from furnishing competitive telephone service in the village of Crossville. The individuals made respondents in this case have not received a certificate of convenience and necessity from the Commission but contend that they are not a public utility but have established an exchange "merely for the mutual advantage of themselves and their families." The Commission points out, however, that "they are occupying the streets and public ways of the village of Crossville with their poles, wires, and appliances, and have connected said telephone wires with a switchboard which they have installed in said village." Several farmers' lines and doctors, merchants and business men of the village are connected with the switchboard. "It quite clearly appears from the facts and circumstances in this case that the individuals made respondents in this case are installing and seeking to operate a telephone system for public use, in a village of about six hundred people which village is already served by one telephone company, without first securing from this Commission a Certificate of Public Convenience and Necessity."

The respondents are ordered to discontinue the operation of the telephone system "until such time as they shall have secured from this Commission a certificate of public convenience and necessity."

The Fayette Home Telephone Company applied for an order restraining William Kepner, et al. from constructing and operating a telephone system in the village of Laclede. The facts in this case are practically the same as set forth in the case given above involving the Commercial Telephone and Telegraph Company. The respondents propose to establish a "mutual" telephone company. Complaint was made that the service of the petitioner is inadequate. The Commission says: "While the testimony shows that the service furnished by the petitioner is neither adequate nor satisfactory and that its poles, wires, and other equipment are not in good condition, yet it further appeared at the hearing that an effort in good faith was being made by the petitioner to improve its equipment and service; and, in fact, that certain improvements had been made and additional work was then under way. It also appears that, with the improved service which the petitioner proposed to furnish, it will be in position to fully and adequately serve the village of Laclede and the surrounding community with satisfactory telephone service." The Commission further concludes that the proposed competitive plant is a public utility and an order was issued requiring respondent to discontinue construction and operation until a certificate be obtained from the Commission.

The Spring Valley Utilities Company was granted a certificate of convenience and necessity to construct and maintain an electric light plant and distribution system in the village of Annawan and to construct a high-tension line from the village of Mineral to the village of Annawan.

The Western United Gas & Electric Company was granted a permission to construct gas mains to and in the villages of Bensenville and Itasca for the purpose of furnishing gas service within the villages.

The Colfax Telephone Exchange was authorized to sell its plant to Edward Entwistle for the consideration of $16,560.

The Lincoln Water & Light Company. A complaint of the City of Lincoln is before the Commission alleging that the Company's rates for water and light are unreasonable.

Urbana & Champaign Railway, Gas & Electric Company. Complaint is made by the citizens of Champaign that the company's charges for electric service are exorbitant.

INDIANA.

Indianapolis Street-Lighting Rates. The City of Indianapolis has completed a contract with the Merchants' Heat and Light Company for furnishing the city with street-lighting service. The contract is to be in force for ten years and the rates to be charged are specified in the agreement. Suit was brought in the Circuit Court to declare the contract illegal and void and to enjoin the city from enforcing the terms of the contract. The contention is made that the Public Service Commission has the exclusive right to fix the rates to be charged for service by public-service corporations. It is alleged that the city of Indianapolis is attempting, in violation of law, to fix rates or prices to be paid the Merchants' Heat and Light Company for a period of ten years. By such attempt, it is averred, the city is seeking to deprive the Public Service Commission of its power under the law.

NEW HAMPSHIRE.

Peoples Gas Light Company. A decision was rendered, June 10, establishing rates for gas in the city of Manchester. In the decision considerable attention is given the subject of "going value" and the proper allowance to be made for preliminary and financing costs, attached business, and early losses. An extensive review is made of the holdings of various authorities in the treatment of going value and decisions of courts and commissions are cited at length. Other valuation matters receiving attention are actual cost or present value of land, paving over mains, depreciation reserve and amount of return.

OREGON.

Standards of Service. The Commission has adopted rules and regulations relating to standards of quality, pressure, voltage and other service conditions of light, gas, heat, water and power utilities effective as of July 1, 1907.

Overhead and Underground Construction. General regulations have been adopted by the Commission governing overhead and underground construction of telegraph, telephone, signal, trolley and power lines, effective as of May 12, 1914. These regulations apply to new construction.

WISCONSIN.

The Oakfield Light & Power Company was authorized to issue $10,000 of bonds to be sold at not less than 75, the proceeds of the sale to be used in paying off an indebtedness of $3,600 incurred on account of construction work already completed and the balance for the proposed transmission line of the company to the terminus of the lines of the Eastern Wisconsin Railway, Light and Power Company of Fond du Lac. The Commission had pre-

viously authorized the applicant to issue $2,000 of stock to pay off a part of the indebtedness referred to above and since only $300 was so paid off the order provides that the remaining $1,700 of this issue shall be immediately cancelled.

The Tomahawk Light, Telephone and Improvement Company received the sanction of the Commission to the issue of $8,000 of bonds, the proceeds to be used in increasing the capacity of its auxiliary steam plant and also to change from single-phase generation of 133-cycle frequency, to three-phase generation of 60-cycle frequency.

Stock and Bond Issues to Telephone Companies. An issue of $2,000 of stock to be made by the Eau Claire County Telephone Company was authorized by the Commission. The order recites that the proceeds of the sale of such stock shall be used for extending lines, buying new telephone instruments and equipment, and for paying as much of the cost of reconstructing the lines of the company as is properly chargeable to the capital account.

The Plymouth Telephone Company applied for and was granted authority to issue $500 of stock, the proceeds to be used in paying off an indebtedness incurred on account of construction.

The Elco Telephone Company received the commission's approval of an issue of $4,000 of stock. Of this amount, $1,340 of the stock was to be used in replacing void stock issued by the company in ignorance of the statutes requiring the approval of the Commission to all such issues. The Commission found in this case that the proceeds of the void issue had been applied to the making of additions and extensions to the plant. The remainder of the issue ($2,660) is to be used in further extending the lines of the company.

Among the Supply Men

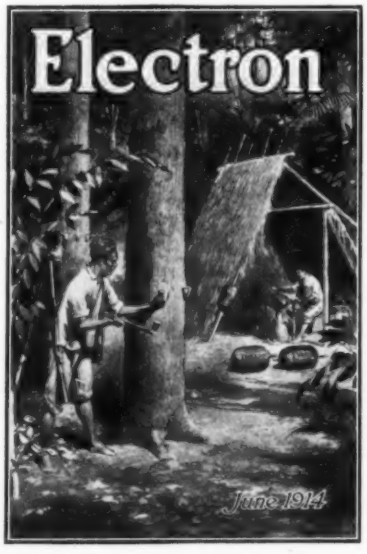
Brisk Electric-Fan Business in Louisville.

Hot weather at the very outset of the season in Louisville, Ky., has done wonders for the electric-fan business in that city. An instance of the way in which this business increased over that of last year is supplied by the records of the Federal Sign System (Electric). According to R. E. Brian, manager of the Louisville office, he disposed of a total of 750 fans all last season. This year, up to and including the first ten days in June, he had sold more than 1,000 fans. Other concerns which supply the fan trade have similar reports to make. The increase is generally attributed to the hot weather early in the season. When the cool weather hangs on until people are getting ready to leave for their vacations, they do not invest as readily. Other influences have been the fact that the merger of the public utilities put the Fetter Electric Company, which supplied direct current only, out of business, thus rendering numbers of direct-current fans useless; the success which has met the house-wiring campaign of the Louisville Gas & Electric Company also contributed. To date 909 old houses have been wired by this company.

An interesting feature of the demand for fans is that the public generally is calling for a better article than used to be the case. The 12 and 16-inch oscillating types are much in demand for domestic uses, while the call for the six-blade, slow-speed fan for houses is gratifyingly large. Most of the fans sold last year and heretofore were for the 8 and 12-inch types. These are not being returned and are probably being put to use in the kitchens or elsewhere and used in connection with the new ones.

Last week also saw a marked departure in the fan trade in the purchase by the Consolidated Realty Company, of Louisville, of five dozen fans which it will supply to the tenants of its Courtland apartment house. These will not result in an increased charge for the rentals of the rooms in this house, which are all well furnished, and will be supplied to all the tenants for four months out of the year.

None of the other apartment houses in Louisville have considered such a move, according to the best available information, and the members of the Consolidated Realty Company had no similar experiences of other landlords to guide them. The company is now building a large new apartment house on Fourth Street in Louisville, which will have about 300 apartments.



Cover Design for June Issue of "Electron."

The *Electron* for June, the interesting monthly publication of the Central Electric Company, Chicago, Ill., contains a great deal of very interesting matter. An article on the illumination of the Lucas County Courthouse described the lighting of this modern public building with Alexalite fixtures and shows some really remarkable photographic reproductions of illustrations of the offices taken at night under this system of indirect illumination. Another article of special value describes the collection of rubber and its relation to uses as insulation in the electrical industry. The front cover design is artistically rendered in colors, and portrays a vivid scene incidental to the gathering of the raw material. There are other items relating to diffused lighting, a description of new electrical material and an article by J. O. Holly regarding the functions of the billing department.

The Electric Supply & Equipment Company, Hartford, Conn., is increasing its scope of operation and now has men traveling in New Hampshire, Vermont, Massachusetts, Connecticut, New York and parts of New Jersey. Heretofore the company has covered principally Connecticut and western Massachusetts only.

A NEW PROCESS FOR THE STERILIZATION OF MILK, USING HIGH-POTENTIAL ELECTRIC DISCHARGES.

By John B. C. Kershaw.

The municipality of Liverpool, England, has for some time been regarded as one of the most progressive in that country, in all matters relating to the health of the community. For several years past the Health Committee of the Council has devoted great attention to the purity of the milk supply of the city, and to the provision of sterilized milk for those infants of the poorer people, who might be dependent upon cow's milk for their proper nourishment. Two depots for the sterilization of milk, by the usual process of heating by steam to 160 degrees Fahrenheit, were equipped in the center of working-class districts of the city, one at Earle Road and the other at Netherfield Road; and from these centers many thousands of bottles of sterilized milk have been distributed daily to those mothers and guardians who could be induced to take advantage of this supply.

The ordinary method of sterilization by heating, however, has been criticized recently by some eminent authorities, and the researches of Robert Mond and Dr. Ralph Vincent have unsettled opinion as to the efficiency of this method of preparing milk that is to be used as a food by infants and young children. According to these two investigators the system of boiling milk is now proved to be wrong, and this method of protecting the consumer against disease must apparently go, in company with modern practices of pasteurization and sterilization. When milk is heated above 150 degrees Fahrenheit the friendly bacteria, which are present in large numbers, are stated to be destroyed, although they are of vital importance to the child; while the dangerous germs, which are controlled in their presence, are said to resist the heat and to develop with great rapidity.

The need for some other method of sterilizing milk is therefore urgent, and it is now believed by many that electricity will supply the demand for a simple yet efficient germicide.

The earlier scientific investigations of the action of electricity upon bacteria in milk and other fluids appear to have been made in Germany, by Cohn and Mendelsohn in 1879, and by Spilker and Gottsetin in 1891.[1]

In America, more recently, Ayers and Johnson have carried out experiments upon the use of ultra-violet rays, emitted from a quartz-tube mercury-vapor electric lamp, for sterilizing milk. In England, Duffield has investigated the effect of high-tension electric spark discharges upon milk, the discharges being passed through a closed glass tube, and air or nitrogen being sucked in, and made to convey the products of the discharge to the samples of milk.[2]

None of these investigations or methods have resulted, however, in any practical success, the milk after the application of the electrical treatment being either unpalatable, or still crowded with harmful bacteria, and it has been left for the Liverpool investigators and experimenters to develop a method of treating milk by electricity, which appears to possess all the requisite essentials of success.

The methods of electric sterilization that have been tried at Liverpool are covered by British patents (No. 17554 of 1911, and Nos. 14840 and 26743 of 1912) granted to Alderman Anthony Shelmerdine, one of the members of the City Council. The two earlier patents protected processes that were mainly electrolytic in character; and although neither of these patents led to any practical results of value, the following summary of the patent claims is of interest, in connection with this description of electrical processes of milk sterilization.

Claim of patent No. 17554, 1911: "In the electrical method or process of sterilizing and purifying milk, subjecting the milk per unit of quantity (200 cubic centimeters) while flowing, to an amperage of about 1.5 to 6.5 amperes, at a voltage of about 200 volts, per 508 square inches of area of the electrodes."

Claim of patent No. 14840, 1912: "Sterilizing and purifying milk by subjecting it to the electrochemical action due to a passage of the electric current through it, and the generation of a halogen antiseptic, such as referred to, within the milk and created by the current, substantially as set forth."

0.01 per cent of common salt was added to the milk before electrolysis in this case.

The experimental work in connection with the development of the process was transferred at this stage to the Thompson-Yates Laboratories of the University of Liverpool, and the following account of the work is based entirely upon the facts and figures given in Professor Beattie's report referred to above.

The following problems were investigated by Professor Glynn, the acting bacteriologist at that time with F. C. Lewis:

(1) The possibility of utilizing an electric current as a sterilizing agent.

(2) The scientific and other factors underlying a successful method, if one could be discovered.

(3) The application of the knowledge gained in the experimental work, to large-scale practice.

It is necessary to discuss all the difficulties that were encountered in this work, which extended over two years, but the following are the main lines of the investigation, and the results achieved.

The effects of unidirectional currents on the milk.—It was found that not only did sterilization "not occur" under the conditions of the experiments, but that profound changes were produced in the constitution of the milk.

The effects of unidirectional and slowly alternating currents, after the addition to the milk of minute quantities of salt, with the object of producing electrochemical sterilization.—By this method sterilization could be brought about, and inoculation of the treated milk showed that the *B. tuberculosis* was destroyed. The milk, treated in this way, however, was spoiled from the consumer's point of view, on account of profound changes in the milk, and after many attempts to overcome the disadvantages, this method was abandoned.

The effects of static charges of electricity across a moving film of milk.—No appreciable effect was produced on the bacteria.

The effects of a rapidly alternating current at high potential.—This was a success, and is the basis of the new system of sterilization, which has been operated on a large scale at Liverpool for many months. Even in the early stages of the work with this method, it was shown that the bacterial contents of the milk could be reduced to a minimum, and that the chemical constitution of the milk was apparently unimpaired.

The last method is protected by Shelmerdine's patent No. 26743 of 1912, and is based upon the use of an alternating current of high potential for "electrocuting" the harmful bacteria contained in the milk.

The sterilizing apparatus consists of a long tube with electrodes inserted in cup or tube-shaped depressions placed at suitable points, and with connections to vats or tanks for holding the raw and sterilized milk.

The sterilizing apparatus used for the early experimental work, with this method, consisted of a long tube (see Fig. 1) with three "indentations" for insertion of the electrodes of aluminum, copper or other metal, the best distance between the electrodes being determined by experiments with extensible rubber tube. The central electrode was connected with one pole of the transformer, and the two outer electrodes were connected in par-

[1] See Professor Beattie's report on "The Electrical Treatment of Milk," 1914.

[2] See Proceedings of the Roentgen Society, December 2, 1913.

allel with the other pole. As the electric supply of the City of Liverpool is on the continuous-current system, an alternator driven by a direct-current motor was installed for these experiments. The whole apparatus was insulated by heavy glass supports and the milk was passed through the tube at a definite speed from a reservoir at a fixed height.

The first trials with this method and apparatus proved that the greater number of the bacteria were destroyed during the passage of the milk through the tube, and its design was then improved, especially as regards the cups or branches for holding the electrodes. These were now made separate from the main tube, and were joined to the latter by rubber connections. (See Fig. 2.)

The dimensions of the apparatus were calculated to allow free and unimpeded passage of the milk without the production of any eddies or pools, and at the same time they made certain that the electrodes adequately commanded every portion of milk passing through the tube. The upper and lower ends of the central cylinder of the electrode chamber were made watertight with rubber stoppers, and in these stoppers the aluminum or copper electrodes were fixed. The improved design has been found to admit of general application and it is now incorporated in the large-scale plant. Instead of having a continuous tube, it is found advisable however, for many reasons, to substitute three of these electrode chambers, connected with one another by suitable lengths of glass tubing and rubber joints. These electrode chambers and their connections, are referred to in what follows as the "lethal tubes." At the inlet end of the lethal tubes, is a vessel containing the milk to be treated. This vessel is provided with valves so that the supply can be regulated at will by the operator; the outlet end is connected to the receiving vessel in such a manner as to avoid any possible infection. Fig. 3 shows the apparatus set up at the University Laboratory. The results obtained by means of this apparatus, according to the report, were remarkably consistent, and the average of 140 separate tests may be summarized as follows.

(1) *Bacillus coli*, and other bacteria of this group, which are practically always present in milk, and are particularly abundant where manurial contamination is present, were completely gotten rid of. It follows that the bacillus of typhoid fever, if ever present, would also be destroyed, as its general resistance to attack is rather less than its group relative *Bacillus coli*.

(2) The pus or abscess-producing bacteria (*Staphylocci*, etc.) were also destroyed, though in some of the earlier experiments of this series a few bacteria of these types escaped.

(3) *Bacillus of tuberculosis.*—Experiments were made with naturally and artificially infected milk, and while in some cases the control animals (those inoculated with the milk before it was treated) died of septic poisoning, and the others which lived long enough developed definite tuberculosis, yet none of the animals inoculated with the same milk after the electrical treatment died, and when these were killed six weeks after the date of inoculation, no trace of tuberculosis was found. These experiments proved that not only was the bacillus of tuberculosis destroyed, but that the bacteria which caused blood-poisoning were also destroyed, or so reduced in number as to render them harmless.

(4) *Other bacteria*, which have no definite relationship to disease, were also in large measure destroyed. In most cases, however, a few of these survived, and were found in the milk after treatment.

The milk was only in rare instances absolutely sterile; but after treatment it was free from dangerous or disease-producing bacteria, and also from the ordinary milk-souring bacteria, and there was an enormous reduction in the number of all other forms of bacterial life. The actual reduction was over 99 per cent.

Professor Beattie states in his report that these remaining bacteria could be got rid of by more elaborate treatment. It was decided, however, that as they were comparatively few in number, and so far as could be ascertained, not concerned in the production of disease, the extra expense and the loss of time which this treatment would involve, could not be justified in connection with the Corporation Milk Depot. Since the ordinary milk-souring bacteria were destroyed, it was only natural to find a great improvement in the general keeping qualities of the milk. Thus, a tumbler of milk kept on the table in the laboratory, and merely covered to prevent dust contamination, would be perfectly sweet and drinkable three days after it had been treated; whereas, if it were kept absolutely free from air contamination, this period was increased, and samples have been found quite palatable after seven and eight days.

Having proved the efficiency of the process in the experimental plant, and having presented an interim report (dated June, 1913) on the work to the Health Committee of the Liverpool City Council, steps were taken to have a larger plant installed at the Earle Road Milk Depot. At this depot there is a large tank on the upper floor capable of holding the full day's supply of milk, 125 gallons. This is connected with a smaller tank, in which the milk can be maintained at a constant level, by a ball-valve arrangement. This constant-level tank is connected with the "lethal tube," which is situated in the ground-floor room, and the flow through the lethal tube is maintained by gravity. From the lethal tube the milk is collected in receiving tanks, and from these it is conveyed to the bottling apparatus, which is situated in the basement. The milk is tipped into the supply tank by means of a combined churn-lifter and tipper, worked by hand, and delivering the milk 15 feet above the street level.

Fig. 1.—Early Sterilizing Apparatus.

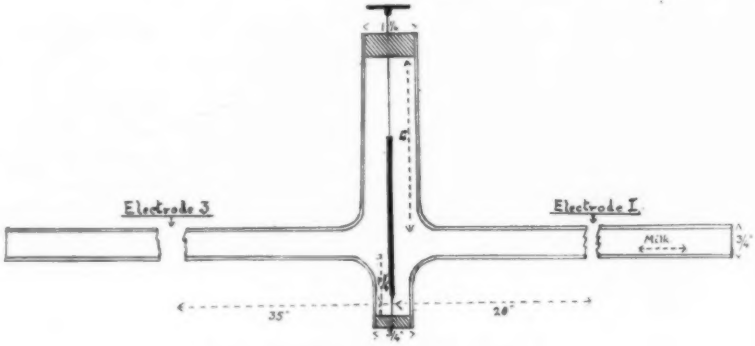


Fig. 2.—Improved Design of Sterilizer.

The electrical apparatus consists of a direct-current motor coupled to an alternating-current generator, a high-tension transformer, together with a current transformer, a pressure transformer, and the usual switch-gear and regulating devices. The transformers are kept in a fireproof cupboard; the lethal tube in a glass-fronted cupboard; and the switchboard is so placed as to give the operator command over the whole installation.

Each electrode chamber is supported in detachable brass claws fitted on a brass back-plate, through which the high-tension cable passes, before it enters a vulcanite chamber, in which it is connected to a spring terminating in a flat circular

disk. The vulcanite chamber is covered by a circular vulcanite cap, and the whole chamber, with its spring contact, forms a cap for the electrode chamber. A nail-headed copper electrode is placed in the electrode chamber, the nail head impinging on the circular disk of the spring, and thus establishing good electrical contact. The measurements of the lethal tube and electrode chamber, are given in Fig. 2. These electrode chambers, supported and fitted as described above, are fastened to a polished slate slab, which forms the back of the glass-fronted cupboard already referred to. For purposes of safety in manipulation, the milk passes through earthed aluminum tubes before and after passing through the lethal tube. Other parts of the apparatus are also earthed.

In order to show the voltage, amperage and temperature used in the experiments, Table 1, with the electrical readings at Earle Road for one day, is given as typical of the daily readings of the instruments.

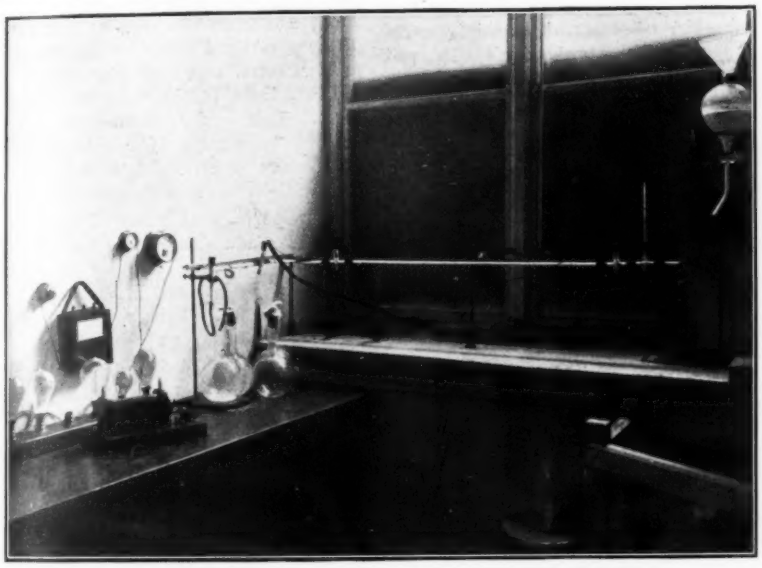


Fig. 3.—Sterilizing Apparatus in the University Laboratory.

TABLE I.—ELECTRICAL READINGS OF TEST AT EARLE ROAD, JANUARY 27, 1914.

Time. a. m.	Volts.	Amperes.	Maximum Temperature.*
8:47	3,950	2.3	61.5
9:00	3,950	3.25	60
9:10	3,900	2.2	60.5
10:00	3,900	2.22	63
10:15	3,975	2.15	62.5
10:30	4,050	2.2	63
10:40	4,050	2.15	63
11:00	4,150	2.1	63.5
11:20	4,200	2.02	62
11:35	4,200	2.05	64
12:00	3,650	2.19	62

*Each unit quantity of milk is exposed to the temperature noted in the table for such a brief period—some seconds—that heating effects can be neglected.

Soon after the Earle Road apparatus was working, difficulties from "flashing" and charring of the milk (which had not occurred except in a minor degree in the experimental plant) were met with. This "flashing" was only noticed at the central electrode, and it was thought that it was due to a slowing down of the milk flow, after the apparatus had been working for some time. A specially shaped electrode chamber, which would overcome the results of any such slowing down, was constructed, but the difficulty was not got over. Ultimately, it was found that by using an electrode of higher conductivity than aluminum, namely copper, the difficulty was overcome, and a reversion was made to the earlier type of electrode chamber. Flashing gives a burnt taste to the milk, and as this might occur just at the end of a day's supply, and spoil the whole of the milk, it was decided to introduce two small supplementary receiving tanks. These two small tanks are covered, and fitted with gauge-glasses; their inlets are connected by an open channel; and their outlets with a covered channel, commanding the main receiving tank. The milk from the lethal tube is delivered into one tank until it is full, and then the delivery tube is put into the inlet of the other tank. During this transference a small quantity of milk collects in the open channel between the two inlets. This milk can then be tested, and if satisfactory, the contents of the first tank can be discharged into the main receiving tank. This tank is again filled, and the other tank discharged, if its supply is satisfactory, and so on. Working in this way, there is practically no risk of charred milk getting into the main supply.

Output of the Earle Road Plant.

The quantity of diluted milk handled daily at Earle Road is from 100 to 125 gallons, and this amount has to be distributed in about 3,000 bottles. Experiments had shown that the bottle-filling apparatus which was in use could still be employed, but that very special precautions would be necessary to ensure that gross re-contamination of the milk did not take place. It was therefore decided to alter the shape of the bottle in order to facilitate cleaning, and to substitute an ordinary cork stopper in place of the complicated spring and rubber stopper. It was anticipated that time would be saved and the chances of contamination greatly reduced by the change, while the cost of the bottles was also reduced. To further reduce opportunities for contamination, a much simplified filling apparatus was designed and introduced. This consisted of a covered tank, entering tubes from the electrical apparatus, gauge glasses, and delivery taps; the latter being operated by a lever handle and their outlets covered by an inverted funnel. In order to fill a bottle with the sterilized milk the operator pushes the neck of the bottle close up to the funnel top, and fills the bottle up to the necessary graduation mark with practically no air contamination. The bottles can be filled very rapidly, and it has already been found that time is saved by this new method.

Bacteriological Results.

Results of the tests made by the Liverpool City Bacteriologist.—Bacteriological examinations are made daily of the milk, both before and after treatment, and from time to time bottles are picked out at random from the stock which is being sent out, and the milk in these is also examined. The results of 15 consecutive days' tests in 1914 are given in Table II.

TABLE II.—TEST RESULTS OF THE LIVERPOOL CITY BACTERIOLOGIST.

	Control sample (untreated milk) 1 cubic centimeter		Treated milk 1 cubic centimeter	
1914.	Bacteria present (grown on agar at 37° C.)	Bacteria grown on neutral red agar at 37° C.	Bacteria present (grown on agar at 37° C.)	Bacteria grown on neutral red agar at 37° C.
Jan.				
26	777,000	1,140	642	0
27	uncountable	180	327	0
28	125,400	1,320	53	0
29	158,400	29	189	0
30	568,000	656	316	0
31	567,600	912	168	0
Feb.				
2	80,000	600	100	0
3	97,500	798	16	0
4	126,500	105	22	0
6	35,400	436	0	0
8	96,400	25	87	0
10	152,460	17	130	0
12	112,200	676	75	0
13	19,840	96	348	0
14	950,000	432	49	0

The bacteria which grow on agar at 37 degrees Centigrade give a fairly accurate representation of the total number of bacteria present in any sample; while those which grow on neutral red agar are *B. coli*, and its allies, which are mainly derived from manurial contamination, etc., and from the main milk-souring organisms.

Results of the tests made by Professor Delepine, Manchester.—The untreated milk was coagulated on the third day at a temperature of 68 degrees Fahrenheit. The sample of electrically treated milk,

although slightly acid, was not coagulated in four days at the same temperature.

From the untreated milk, 352,950 colonies per cubic centimeter developed in four days at room temperature; no colonies were obtainable from the electrically treated milk in ten days at the same temperature.

The untreated milk showed "at least 1,700" *B. coli;* this bacillus was absent from the electrically treated milk.

Bacteria of four types were found in the treated milk when kept at 37 degrees Centigrade, but the numbers were considerably reduced as compared with the untreated sample.

Professor Ritchie, Edinburgh.—From the untreated milk 180,000 colonies were developed in 48 hours, at room temperature, from one cubic centimeter of milk. From the electrically treated milk no colonies were obtainable for six days, after which 20,000 were estimated at room temperature.

The ordinary milk contained 1,330 *B. coli* per cubic centimeter. The electrically treated sample did not contain any *B. coli.*

Professor Woodhead, Cambridge.—The total number of bacteria in the untreated milk was 16,000,000; in the treated sample the number was 185 per cubic centimeter at 37 degrees Centigrade.

The untreated milk showed 60,000 *B. coli* per cubic centimeter. The electrically treated sample did not contain any *Bacillus coli.*

The practical and bacteriological results of the electrical process of milk sterilization as carried on at Liverpool, England, are summarized as follows by Professor Beattie, the city bacteriologist.

(1) The electrical method of treating milk destroys the disease-producing bacteria, which are found in it.

(2) The main milk-souring bacteria are either completely destroyed or, if some members of this class are left, they may be neglected so far as the keeping power of the milk is concerned, for ordinary household use.

(3) The milk is not sterilized in the strictest sense of the word, but there is a reduction in the total number of bacteria by 99.93 per cent (See Table II).

The whole of the bacteria are not destroyed in heat-sterilized or pasteurized milk, for the reason that some bacteria can resist a boiling temperature for some minutes; and that at temperatures below boiling point, they may resist for prolonged periods. This differentce is, no doubt, also exhibited towards electricity.

(4) The milk will keep perfectly sweet for at least three or four days after treatment, and this period will cover distribution and use in all cases of household milk supplies. The keeping power is much prolonged if the milk is protected from after contamination.

(5) The chemical constitution of the electrically treated milk, so far as can be ascertained by chemical analysis, is unimpaired, and the taste is not in any way altered. The milk, from this point of view, may be described quite accurately as "raw milk."

(6) The milk is not only rendered non-pathogenic as regards ordinary bacteria, but in two cases in which the control supply was tuberculous, the electrically treated milk was non-tuberculous.

(7) The milk after treatment is perfectly satisfactory as a food for infants.

The most important perhaps of these conclusions from the point of view of the general public is (6), which states that milk which is tuberculous and capable of producing tuberculosis in animals or human beings who drink it, is rendered harmless by the electrical treatment described in this article.

Now that the "white scourge" of the human race is receiving so much attention, and such great efforts are being made to stamp it out, a method of attack which takes one of the chief sources of the disease, namely cow's milk, and kills the dangerous germs contained in it, before they have time or opportunity to do any harm, ought certainly to be adopted by all civilized countries.

The Liverpool City Corporation, as already stated, is acting as the pioneer in this new method of treating milk, but in time it is likely that private firms of milk purveyors will see the wisdom of adopting the electrical process of sterilization, and that every dairy of any size and reputation will have its electrical equipment, and "lethal tube," for electrocuting the dangerous bacteria that lurk in our milk supplies.

The writer's thanks are due to Dr. G. W. Hope, chief medical officer of health for Liverpool and to Professor Beattie, the city bacteriologist, for their kind assistance and the loan of photographs, etc., used in the preparation of this article.

Joint Electrical Illumination Meeting in Chicago.

On the evening of June 10 there was held a joint meeting in Chicago in which participated the Chicago Sections of the Illuminating Engineering Society and the American Institute of Electrical Engineers, and the Electrical Section of the Western Society of Engineers. Announcement was made that the letter ballot on the election of Chicago Section officers for the American Institute had resulted in the choice of E. W. Allen as chairman, W. J. Norton as secretary, and D. W. Roper as member of the Executive Committee to serve three years. A communication was presented from Secretary Hutchinson, of the Institute, stating that persons attending its annual convention in Detroit next week will be met at the railroad depots by automobiles provided by the local committee; any that wish to take advantage of this service should communicate their time of arrival to C. C. Owens, chairman of the local committee, Dime Savings Bank Building, Detroit, Mich.

Design of Illuminated Signs.

The first of the two papers presented was entitled "The Design of Illuminated Signs." This was by Arthur H. Ford, professor of electrical engineering, University of Iowa. In opening his paper Professor Ford stated that he would attempt to set forth the laws governing the legibility of illuminated signs and a method of designing which will procure legibility at any predetermined distance. Legibility of a sign is dependent on the acuity of vision of the observer. An explanation of this, based on the anatomy of the eye, was made. It has been found both by optical measurements and by experiment that the maximum possible acuity is about 2,000, that is, this is the ratio of the greatest distance away from two parallel lines, at which they appear as separate lines, to the distance between them. This acuity constant has been derived by the use of two black lines on a white sheet, which is the reverse of the conditions in illuminated signs.

An experimental study of this matter was made and it was found that there is a marked decrease in visual acuity as the intrinsic brilliancy of the lamps increase. This is explained as follows: Whenever the images of two parallel lines form on the retina, the lines appear as one unless the images are sufficiently far apart to leave a row of cones between them that are stimulated weakly or not at all, in the case of two lines lighter than the background, or a row of highly stimulated cones when the lines are darker than the background. The effect does not seem to be confined to the cones upon which the image falls, when the stimulus is intense, but it seems to spread to adjacent cones. Thus, two bright images must be further apart in order that there may be an unstimulated row of cones between them than is the case when two dark lines have a row of stimulated cones between them.

In the design of solid-letter designs with dark background, the distance between the letters and the elements of the individual letters must be greater than the maximum distance at which the design is to be read, divided by the visual acuity for the luminosity used in the letter. If the sign has dark letters on a light background the width of an element of a letter must be greater than the maximum distance at which the sign is to be read, divided by the visual acuity for the luminosity of the background. Therefore, the letters of the dark-letter sign must be larger than those of a light-letter sign

in order to have equal legibility. A luminosity of three lumens per square foot is satisfactory under most conditions. Experiment showed that as the luminosity is increased the distance of legibility first increases and then decreases to a definite minimum.

The design of point-letter signs is a difficult problem on account of a number of limitations. The individual lamps of each letter must be closer together than the elements of the letter. The lamps should be so closely spaced that there will be two in the shortest element of the letter.. Signs made with a large number of lamps per letter are very legible. In approaching a point-letter sign a person first sees a blur of light, then the letters, and finally the individual lamps; at this time the forms of the letters almost disappear. This is particularly noticeable when approaching the sign at an angle. By using frosted lamps these defects are overcome to a large extent. Point-letter signs made from illuminated bull's eyes are usually more legible than those made up of lamps.

The defects of the point-letter sign are largely overcome, while retaining the drawing power of the brilliancy of such a sign, by mounting the lamps on a solid-letter sign in which the troughs are of light color. This is because the reflection of light from the letter fills the dark gaps between the individual lamps. Most makers have used too few lamps per letter. This was borne out by experiment. It is futile to use high-power lamps unless they are of such size that a large number of lamps can be used for each letter.

Professor Ford suggested as the most desirable sign for ordinary use, one with solid letters for its legend and a border of lamps, if it is desired to attract the attention by means of brilliancy of the sign. The spaces between the letters or parts of the letter should be greater than the distance of the observer, divided by 1,000 when the observer is at the greatest distance at which the sign is to be read. The next best sign from the standpoint of legibility, in his opinion, is one with trough-shaped letters, in which are bowl-frosted lamps having V-shaped filaments. The frosting should be thick enough to reduce the light received directly from the lamp to the same intensity as that reflected from the trough. The shape of the trough should be such as to equalize the light given off in different directions so as to make legibility independent of the angle at which the sign is observed.

The discussion on Professor Ford's paper was opened by R. E. Cleveland, of Cleveland, O., who told of some research work he had conducted along similar but more practical lines. A special photometer was arranged to permit making a study of the best proportions of letters. It was found that greatest legibility at a distance resulted when the height of the letter was about 15 times the width of its lines. Legibility also was increased when the width of the letter was increased, also when the spacing between letters increased. Mr. Cleveland's work was made with adjustable letters and is being continued.

A communication was presented from Evan J. Edwards, Cleveland, O., who corroborated Professor Ford's conclusion that legibility increases when the intrinsic brilliancy is decreased. However, commercial considerations require a striking appearance in order to attract and, moreover, many signs are mounted so that view of them is obstructed from a distance so that legibility at a distance is not called for.

L. G. Shepard, Chicago, Ill., said that sign manufacturers had given much attention to the influence of many factors on sign legibility. There are many considerations, such as cost and size of sign, that limit the designer in laying out a sign on scientific lines. Atmospheric conditions, like smoke, fog and dust, also influence the legibility of signs. Mr. Cleveland admitted that these affect the legibility, but not always in the same way; some cloud and fog conditions have the opposite effect that others produce.

Dr. Harry Gradle, Chicago, touched on the influence of the anatomy of the eye on sign legibility. Since the greatest acuity of vision is in the macular region of the retina, a sign should not be too large to be taken in at a single glance. Professor Ford's conclusions as to the relation of legibility and intensity of illumination are borne out by the observation of several ophthalmologists.

Mr. Shepard and Mr. Cleveland both called attention to the influence of the subject. Scarcely two people get exactly the same impression from an illuminated sign. In closing the discussion, Professor Ford said that his aim was to reduce his investigation to the simplest possible basis, that of parallel lines. Therefore, his results are simpler to interpret than those of Mr. Cleveland, who is working with variously shaped letters. It all reduces to the fundamental proposition that the elements of a letter, or two separate letters, must be kept far enough apart to distinguish them as different points.

Street Lighting in Chicago.

A paper with this title prepared by P. E. Haynes, of the Department of Public Service of the City of Chicago, was read in the absence of the author by W. R. Matheny. This paper opened with a brief review of the development of street lighting in Chicago. At the present time four general types of lamps are used, namely, arc lamps, tungsten lamps, incandescent gas lamps and incandescent gasoline lamps. The use of arc lamps is confined chiefly to business districts, streets having heavy traffic, residence streets which have relatively few trees, and those districts where the density of population does not warrant the high initial cost of ornamental tungsten lighting. At present there are in use about 19,000 arc lamps; of these about 1,160 are flame arcs supplied by the Commonwealth Edison Company; there are about 10,280 ten-ampere flame arcs on the city's circuits; about 1,000 direct-current open arcs and about 6,000 alternating-current inclosed arcs are still in service.

The paper described the chief features on which the selection of the standardized flame arc lamp was determined. A total of 168 points was determined as being required for the ideal lamp and the various characteristics were given weight in about the following order: reliability, 30 points; carbon consumption, 25 points; accessibility of mechanism, design, materials, each 20 points; total light flux, light distribution, light constancy and light efficiency, each 10 points; mechanical efficiency and voltage regulation, each 5 points; power factor, 3 points. The manner in which the various lamps that had been submitted were tested for these points was described, particularly the test of accessibility. The various lamps were taken apart and reassembled by skilled mechanicians who were timed during the operation.

All of the posts now standardized for Chicago street lighting, and which were described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of September 6, 1913, were illustrated in the paper. Ornamental tungsten-cluster lighting must all be converted into a standard type of post within the next few years. This post, as well as the posts used by the city itself, have been designed by the Municipal Art Commission. For the series tungsten system used in residence streets where trees are abundant, the old gas lamp-posts were employed. Although the illumination values are not high, it has been found that the actual visual efficiency is very good.

The illumination of a large number of street subways under elevated steam-railroad tracks was described. Some of the track-elevation ordinances require the railroads to illuminate the subways in accordance with specifications drawn up by the city, the remainder are now lighted by the city itself. The system proposed by the railroads produced a number of glare spots, alternating with deep shadows. An installation was then

made by the city and this, with some slight modifications, has been adopted as standard; 25-watt tungsten lamps are used throughout the subway lighting. The roadway is lighted by means of lamps placed in angle reflectors at the curb line, which are turned 45 degrees in the direction of traffic, to avoid glare in eyes of drivers. The sidewalks are illuminated by lamps placed directly overhead. For each 400 square feet of subway area one 25-watt lamp must be provided. All lamps are provided with porcelain-enameled steel reflectors. In those subways lighted by the city over 4,000 lamps are now used. Incandescent lamps were selected instead of arc lamps on account of the large number of track-supporting columns which cast annoying shadows where only few lamps were used.

The paper also described gas and gasoline street lighting, which is gradually being restricted. All the gas lamps have been converted into the incandescent-mantle type, chiefly with inverted mantles. On some of the streets where a more ornamental effect is desired the inclosed globe is an opal vase-shaped globe. Where neither electricity nor gas are available incandescent-gasoline lamps are used, but on account of the increasing cost of fuel these are being diminished rapidly. A method of testing gas and gasoline lamps for maintenance was described; 25 per cent of all these lamps in service are inspected each month while lighted. The inspection includes a general supervision together with a simple photometric test. The monthly bill of the contractors providing these types of lighting is based on the percentage found as a result of these inspection tests. The paper closed with a brief description of the city's street-lamp testing laboratory, the facilities in which are arranged to permit of quick tests of any type of lamp in service.

Discussion of this paper was opened by A. J. Sweet, Milwaukee, Wis. He reviewed in a brief analytical manner the objects of street illumination, which are sixfold: safety from collission, safety from attack, safety from burglary, convenience in recognition of passers by, convenience in avoiding stumbling, convenience in avoiding puddles. Mr. Sweet also analyzed the four methods by which we discern objects in a lighted street, these are by silhouette effect, by illumination effect, by shadow effect, and by glint effect. In all street-lighting problems the first thing to consider is exactly what we are trying to accomplish, then it is possible to lay out the lighting to accomplish this in the most effective manner.

Hans Schaedlich, of the Chicago City Department of Gas and Electricity, describes some tests made on a Chicago street with gas-filled tungsten lamps. Seven of these were connected into a 10-ampere arc circuit, alternating with flaming arcs. The Chicago lighting circuits are all fed from the star-connected secondaries of transformer banks, whose primaries are delta-connected. The neutral point of the secondary Y is grounded; any ground on a line therefore forms a short-circuit of the line. To test the effect of such grounding on the gas-filled lamps, two of them were put into a fully loaded experimental circuit and all the rest of the load suddenly short-circuited though an oil switch; although repeated some 20 times, the lamps withstood the strain perfectly and are now in service on arc circuits. This test was much more severe than any strain likely to be imposed on the lamps in operation. The city has selected for trial installation 300-watt, 600-candlepower lamps of this type, each equipped with a 10 to 20-ampere compensator, special refractor, diffusing globe and a housing designed to correspond closely with that used for flame arc lamps. This type of lamp, on account of its steadiness of light and lack of light depreciation during life, is considered superior to the flame arc lamp with its maximum of 1150 candlepower through a diffusing globe.

J. R. Cravath, Chicago, spoke of a recent evening inspection he had made of the different systems of street lighting used in Chicago. On West Congress Street, where some nitrogen lamps were alternated with flamed arcs, he was surprised at the excellent manner in which the new lamps showed up to their arc rivals. Big differences were noticeable in the performance of the latter, whereas the nitrogen lamps were perfectly steady. It looks as if the days of the arc lamp are really numbered. Of the various systems of electric lighting in use on Chicago streets, probably the most pleasing and satisfactory all around is that using 80 or 100-candlepower series tungsten lamps in single inclosed units for each 75 feet of street length. Although the illumination these give is not very high, it is quite uniform. The question comes up in each installation, how far can we go in increasing the number of units and decreasing the space between them to get uniformity of illumination without prohibitive cost?

Program of Society for Promotion of Engineering Education.

The twenty-second annual meeting of the Society for the Promotion of Engineering Education will be held at Princeton, N. J., June 23 to 26. The sessions will be held in the Palmer Physical Laboratory. Sessions for the reading of papers will be held each morning and afternoon. The following papers and reports will be presented: "The Financial Department of a School or University," by T. H. B. McKnight; "The Relation of the Administrative Department to the Teacher," by C. R. Mann; Report of the Committee on College Administration; "Education in Scientific Management," by Hugo Diemer; "Academic Efficiency," by L. M. Passano; Reports of Committees on Improvement in Laboratory Instruction, by Charles F. Scott, F. P. McKibben, A. M. Greene, and F. W. Sperr; Report of Committee on Teaching Mechanics to Engineering Students, by E. R. Maurer; Report of Committee on Teaching Physics to Engineering Students, by D. C. Miller; "Practical Mathematics," by W. S. Franklin, Barry MacNutt, and R. L. Charles; "The Calculus Without Symbols," by E. R. Hedrick; "The Use of the Differential in Calculus," by E. V. Huntington; Report of Committee on Entrance Requirements, by J. J. Flather; "The Preceptorial System and Electrical Engineering at Union College," by W. L. Upson; Report of Committee on Statistics, by A. J. Wood; "Teaching Engineers How to Study," by George L. Sullivan; "Giving Instruction in Methods of Study," by W. H. Kenerson; Report of Joint Committee on Engineering Education, by Desmond Fitzgerald; "Co-ordination in Engineering Instruction," by A. B. McDaniel; "Study of Technical College Catalogs with Respect to Descriptions of Courses of Study and Instruction," by H. S. Jacoby; "Grading of Students by Universities versus Grading of Technical Graduates by Employers," by C. F. Harding; "Better Textbooks," by F. H. Sibley; "A Report of Progress in Co-operative Education," by A. M. Wilson; Report of the Committee on Co-operation with Secondary Schools, by H. E. Webb; Report of the Committee on Technical Nomenclature, by J. T. Faig; "A Department of Engineering at the John Hopkins University," by J. B. Whitehead; "Proposed Courses in Structural Engineering for Civil Engineering Students," by W. M. Wilson; "The New Mechanical Engineering Course at Columbia University," by Charles E. Lucke.

On Wednesday evening there will be a lecture by W. F. Magie on "The Meteor Crater in Arizona." On Thursday evening the annual dinner will be held, followed by the presidential address by G. C. Anthony. On Tuesday afternoon there will be a reception by President and Mrs. Hibben,, and on Tuesday evening a smoker.

Cottrell Electrical System of Smoke Deposition.

F. G. Cottrell, of the United States Bureau of Mines, delivered a most interesting talk before the Utah Society of Engineers at the Consolidated Music Hall, Salt Lake City, Utah, on the evening of June 10, on his electrical system of smoke deposition.

Dr. Cottrell's talk was an especially timely one, in view of the strong agitation which has developed in Salt Lake City during the past three or four years looking to some solution of the smoke nuisance, which has become so serious with the rapid growth of the industrial plants of the city.

Dr. Cottrell pointed out that it was known as early as 1824 that finely divided solid particles carried in suspension in the air could be deposited on a plate by means of a brush discharge from a static machine in the field. No practical progress was made, however, owing to the fact that the static machines available at that time were entirely inadequate in commercial application.

Again in 1850 in an article in the *Mechanics Magazine*, of London, the same phenomenon was reported and attention was called to the fact that this could be used for the purpose of throwing down finely divided particles carried in suspension in the air.

Sir Oliver Lodge in 1884, without a knowledge of the work of previous discoverers, reported before a meeting of the British Society of the Chemical Industry his discovery of this fact, and patents on the general principle were taken out at that time in Great Britain and several other countries. These patents have long since expired.

In 1905-6 Professor Cottrell, then connected with the University of California, took up the work. The big advance which he made in the process consisted in the abandoning of the static machine as a source of high-potential direct current. He arranged to tap off the peak of the voltage wave from a high-potential alternating-current circuit, thus securing a high-potential unidirectional source of energy. This permitted the practical application of the process to sulphuric acid plants, powder works, cement plants, and smelters.

At Riverside, Cal., 90 tons of cement dust per day are recovered from the flues of the Riverside Portland Cement Works by this process with a power expenditure of only 35 kilowatts. It is reported that the waste product recovered practically pays for the expenses of operating the system.

Dr. Cottrell frankly states, however, that he does not see how this process can be successfully applied to the solution of the smoke problem in Salt Lake City except in special cases. He believes that the solution lies more in the direction of securing a smokeless fuel and urged that the city take steps to have a careful economical survey made to determine whether or not the problem may be thus solved.

Dr. Cottrell has been conducting a series of experiments on the Murray plant of the American Smelting & Refining Company for the past several months and these experiments have been highly successful. The prospects for the complete elimination of the poison-laden dust from the smelter flues are quite assuring.

The smelters in the Salt Lake Valley have had to pay thousands of dollars per annum in damages to the farmers on account of the injury to their crops by this flue dust, and a solution of the problem will be welcomed.

New York Electrical Society.

The annual meeting of the New York Electrical Society was held on June 10.

The treasurer reported that 75 per cent of the heavy debt with which the Society started the season has been removed, and it is now certain that the whole amount will shortly be paid off.

The secretary reported that during the year 83 members have been elected, 43 have resigned and 128 have been dropped for non-payment of dues. The actual membership numbers 702. The average attendance has been 148, which in these days of multiplied organizations is an excellent indication of the interest attaching to the subjects treated.

William P. Kennedy's lecture on "The Electrical Vehicle in New York City" was followed by a series of motion pictures.

Wireless Weather Forecasts for Great Lakes.

A daily weather bulletin for the Great Lakes is now being sent out from the radio station at Radio, Va., according to an agreement just arrived at between the United States Weather Bureau and the United States Naval Radio Service. This bulletin is sent out in two parts. The first consists of code letters and figures describing the weather conditions actually prevailing at 8 p. m. that day at various points along the Great Lakes. The second part of the bulletin is a special forecast of the winds that will probably be encountered on the lakes. This is distributed to shipmasters on the Great Lakes by the Naval Radio Service during the season of lake navigation—usually from about April 15 to December 10—in the same way that weather conditions for the North Atlantic Ocean and the Gulf of Mexico are sent out.

Civil Service Examination for Assistant Radio Inspector.

The United States Civil Service Commission will hold a competitive examination for assistant radio inspector at the usual places on July 8. The salary for this position is $1,200 per annum; vacancies are to be filled in the offices of the radio inspectors of the Bureau of Navigation at New York City, San Francisco and Cleveland, and possibly others. One-half the credit in the examination will be based on practical questions on the use and adjustment of radio apparatus and auxiliaries; the other half of the credit will be based on experience and education in the line of the required duties. These are primarily to assist radio inspectors in the enforcement of the wireless communication laws. The assistant inspectors are required to inspect radio equipment on board vessels and in land stations.

Applicants must be men over 20 years years of age and should be graduates in electrical engineering from technical schools of recognized standing or have had not less than two years' experience in special radio work. While not essential, it is desirable that they be wireless operators. Applicants should write to the Commission at Washington, D. C., for application form 1312, stating also the title of the examination for which the form is desired.

Trenton Telephone Gathering.

The fourth annual banquet of the Trenton (N. J.) Telephone Society of the Bell Telephone Company was held at the Trenton House in that city on June 12. J. Henry Daly, president of the society, officiated. Among the guests were L. H. Kinnard, vice-president and general manager; F. I. Daly, assistant secretary and treasurer; J. H. Crosman, Jr., general commercial superintendent; and W. F. LaRoche, general superintendent of plant.

Additional Street Lighting for Pittsfield.

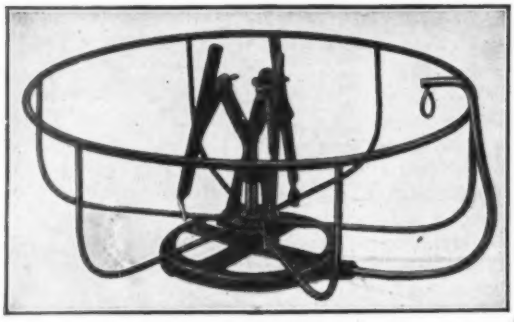
The committee of the Pittsfield, Mass., city government in charge of street lighting has voted to recommend the installation of 51 6.6-ampere luminous arc lamps by October 1 on West and North Streets, between the Boston & Albany station and Maplewood Avenue. The City Council was to act upon the proposed street-lighting contract with the Pittsfield Electric Company at a meeting on June 15. The contract is of five years' duration and the company has offered to supply service at a price of $101 per year, compared with the present price of $108 paid for 500-watt, 10-ampere flaming arc lamps on these streets. The Pittsfield Electric Company is to install and own the entire system.

New Electrical and Mechanical Appliances

A New Wire Reel.

The Wiring Equipment Company, 30 Church Street, New York, N. Y., has recently put on the market a new reel, known as the "Real" reel, for handling wire. This reel will handle any kind of wire manufactured, whether plain or insulated, single or multiple strand; flexible conduit, wire or manilla rope, bare iron wire, copper wire, aluminum wire, in other words any material put out in coils, barbed wire included. When a coil of wire is placed on this reel, it need be given no further attention, and it can be drawn off at any speed without snarling, tangling or kinking.

The coil is held in a basket revolving on a ball bearing, which prevents the wire from escaping. The wire is fed out through a loop on a stationary arm, and when the operator stops reeling off the wire, the reel automatically brakes itself. The reel has no wearing parts nor loose parts, and needs no oiling. This reel has an expanding core which snugly fits coils having any inside diameter from 4 to 15 inches.



New Wire Reel.

For dealers in wire, the new reel has proven a great convenience in winding off wire for sale. These reels are made in two stock sizes, one weighing 12 pounds, with 24-inch inside diameter, and another weighing 6 pounds, with 12-inch inside diameter. Special sizes can be made to order on short notice.

New Designs in Parian Glassware.

"Parian" is the name chosen for the well known line of illuminating glassware sold by the H. W. Johns-Manville Company. It was selected because of the close resemblance of this material to beautiful Parian marble. The glass, even when unlighted, is highly attractive. The makers claim that Parian ware absorbs a minimum amount of light. The excellent diffusion results in a peculiar soft radiance that is very pleasing.

Because of its characteristics, Parian ware is being adopted extensively by stores, offices, churches, theaters, public buildings, auditoriums, for residences, and especially in those edifices where harmony and beauty are considerations.

Period designs have been artistically produced and there are now ready, Louis XV, Grecian, Empire, Dresden, Elizabethan, Venetian, etc. These are offered as bowls, hemispheres, spheres, wall lights, pendants, showers, and reflector shades. The colors offered afford a wide choice and include many delicate pastel shades, such as old rose, old ivory, ecru, verde, rose verde, gold verde, old gold, gold, etruscan brown, etc. Other tints of this Parian ware can be ordered to match special furnishings.

Outlet-Box Cover and Receptacle.

Improved Outlet-Box Receptacle and Cover.

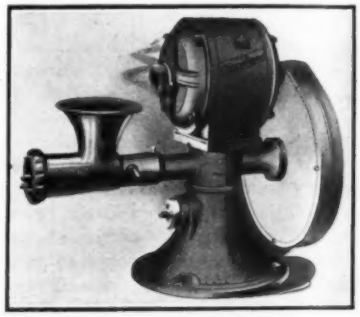
In line with its policy of continually improving its products, the firm of Pass & Seymour, Incorporated, Solvay, N. Y., has recently changed the combined receptacle and cover for four-inch boxes. Formerly this was supplied with a flat cover. By making it cup-shaped, however, it has been found that there is a great deal more room in the box for working.

This fitting is made with either brass or iron cover. In the former case it is finished in brushed or polished brass. The iron covers are either japanned or sherardized. Each receptacle is furnished with six inches of No. 14 stranded, new-Code rubber-covered wire for convenience in connecting to the outlet.

Motor-Driven Meat Chopper.

A noteworthy feature of the motor-driven meat chopper shown in the accompanying illustration is its extreme simplicity. It forms an exceedingly compact unit, with all working parts totally inclosed so that it is perfectly safe and is readily kept clean. Finished in red and aluminum bronze, it forms an ornamental addition to any butcher shop.

The height is 23 inches, width 16 inches, length 28 inches, and weight 240 pounds. With a one-half-horsepower motor, its capacity is 350 pounds of beef per hour. The chopper can be removed and placed in the cooler so that cleaning after every run is unnecessary.



Electric Meat Chopper.

It is made by the Cleveland Electric & Manufacturing Company, Cleveland, O., and is driven by a Westinghouse inclosed motor.

Improved Motors for Chicago City Railway Company.

The 200 new motors in two-motor-equipments recently supplied by the General Electric Company to the Chicago City Railway Company, for service on its new cars, while following generally the well defined lines of modern railway-motor practice, embody many improvements in details of design and construction that are of in-

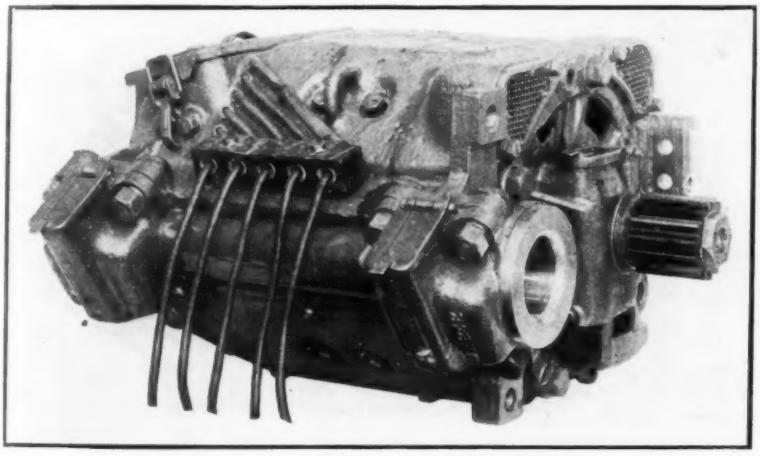
terest. These motors, known as GE-242-A, are of the ventilated, commutating-pole type, designed for tapped-field operation, and are fitted with the system of induced ventilation which has been developed and very largely applied by the General Electric Company during recent years.

Under the standardization rules, the new motor has an hourly rating of 65 horsepower on 600 volts, and of 55 horsepower on 500 volts, but has a largely increased service capacity when compared with motors of the closed type having the same hourly rating, on account of the positive circulation of air which is maintained through the motor.

The use of cast iron has been entirely eliminated from the design, steel or malleable iron being used for castings, and pressed steel or drop forgings wherever practicable.

The frame, which is of soft cast steel, approximately octagonal in section, is of the box type, admitting of efficient design of field coils, armature and bearings. A bored opening, to take the frame head, is provided at each end, the one at the pinion end being sufficiently large to enable the armature, field coils and pole pieces to be easily inserted or removed.

The frame heads are solid and form the housings for the armature-shaft bearings. They are provided with large boxes for oil and waste, and have auxiliary oil wells for filling and gauging the supply of oil. They also have wells into which is drained any oil that

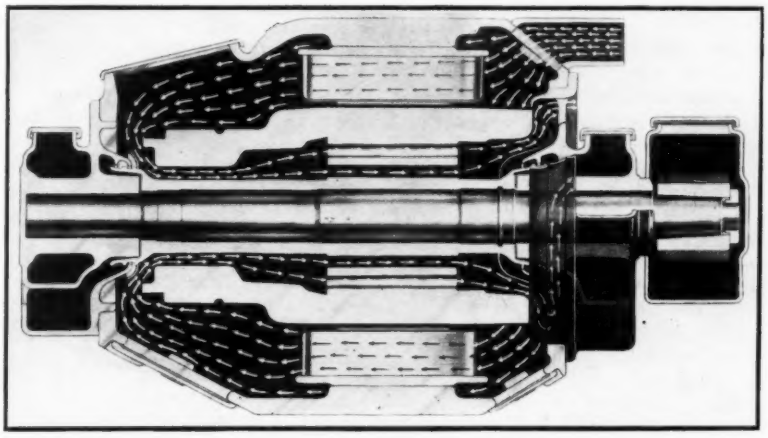


New Ventilated Direct-Current Railway Motor.

may be thrown off by the deflectors on the shaft.

Ample facilities for internal inspection have been provided. The cover over the commutator is fitted with a spring locking device, which, while being absolutely secure, admits of instant removal of the cover. The armature bearings are of bronze, lined with babbitt of such a thickness that, should the babbitt be melted out by overheating, the bronze will still support the shaft without injuring the bearing surfaces and also prevent the armature from touching the pole pieces. The axle is completely inclosed between bearings by a sheet-steel guard, which effectively protects the bearings from dust.

Four exciting pole pieces are built up of soft-iron laminations and assembled on a key, into which are screwed the bolts securing them to the frame. They are located at an angle of 45 degrees to the vertical, with the commutating poles on the vertical and the horizontal center lines. The commutating pole pieces are drop forgings.



Section Showing Ventilation Paths.

The field coils are wound of strip copper, insulated between turns with asbestos, the whole being mummified and insulated with varnished cambric and heavy tape, making them practically indestructible and moisture-proof. They are supported by improved spring-metal seats and spring flanges, giving an evenly distributed pressure, and preventing movement and abrasion.

The armature core has 35 slots. The soft-steel laminations are keyed to the shaft and securely held between steel armature heads. Provision is made for removing the shaft without disturbing the windings or connections to the commutator.

Rectangular wire is used in the armature windings. The coils are pressed to exact shape in a steam mold, covered with insulating material, taped and impregnated with insulating compound by the vacuum process. When all coils are assembled, the armature is heated and temporary binding bands put on under considerable tension, which press down the coils well into place. When cold, these bands are removed and permanent bands of tinned steel wire are wound on in recesses provided for the purpose. These are secured by mechanical means in addition to their being soldered. This construction positively insures permanently tight armature coils.

The commutator is built up of hard-drawn copper bars, insulated from the steel shell by cones of the best grade of mica. The bars are insulated from each other by similar mica, grooved 3/64 inch below the surface of the commutator.

For the brush-holder supports drop forgings are used, into which are pressed two mica insulated studs. These pass through porcelain insulators having exceptionally long creepage distances, and are securely held by drop forgings bolted to the frame by tap bolts inserted from the outside. The brush-holder body slides in finished ways on the support and maintains correct alinement throughout the range of adjustment. The body, which is of bronze, is of substantial design and affords thorough protection to the fingers and springs. The brushes slide in accurately machined ways, independent pressure fingers being provided for each brush.

These fingers have drop-forged copper tips, which are pressed against the brushes by open-wound spiral springs. These springs are of steel, oil treated, and of such a design that the tension remains practically constant throughout the limits of wear of the brushes. The tension can be adjusted by means of a ratchet wheel and pawl. A flat shunt of woven copper wire is provided. The brush-holder lead is attached to the support, which admits of removal of the holder without disturbing any electrical connection.

A positive circulation of air through the motor is maintained by means of a powerful fan cast integral with the pinion-end armature head. Air is drawn in through screened openings in the corners of the frame at the pinion end. It passes over and around the field coils and pole pieces to the commutator end; thence it returns through the commutator shell, through longitudinal ducts in the armature core to the fan, and is exhausted through cored holes in the pinion-end frame head to the exterior. The circulation of air is shown in the sectional view, page 1255. By this means heat is very effectually dissipated from the motor and the service capacity very largely increased.

Gears and pinions of armorized steel have been supplied. These have a ratio of 4.73 to 1, a diametral pitch of three, and a working face of five inches.

The "Red Devil" Handy Hammer Snip.

To the mechanically inclined every new need in the vast field of industrial machinery, whether for a special tool or a special manufacturing process, suggests some particular instrument or appliance to meet the new condition.

Such indeed seems to be the constant experience of the Smith & Hemenway

Handy Hammer Snip.

Company, Incorporated, whose fertile inventiveness has just added to its "Red Devil" tools a most useful and practical little tool, which has been called a "Handy Hammer Snip."

Resembling somewhat a tinner's "snip," the blades of this tool are very narrow so that circles may be cut as easily as a straight line. But the most unique feature of this tool consists in the happy combination of hammer and snip. The hammer head, slightly convexed, is placed opposite the turning center. Since the length of the tool is only eight inches and its weight but eight ounces, its action is quite effective and powerful for its size.

The illustration herewith gives a clear idea of this clever little tool, for which machinists, tinners, and automobilists in particular, will undoubtedly find many uses. Samples and prices can be secured by applying directly to Smith & Hemenway Company, Incorporated, 150 Chambers Street, New York City.

New Outlet-Box Attachments.

Another addition to the well known line of J. C. P. specialties, making the line of outlet-box attachments manu-

Outlet-Box Attachment Ready for Insertion in Open Outlet-Box Cover.

factured by James C. Phelps, of Springfield, Mass., most complete, is a new and practical device for extending conduit from an open outlet-box cover. This is a very convenient fitting for connecting exposed conduit work into an open outlet-box cover that is plastered into the ceiling.

This attachment is also made for extending metal molding in the same manner as extending conduit. It is easily and securely attached, no special screws or lugs being necessary on the outlet-box cover.

Conduit Extended from Outlet-Box Attachment.

These fittings are marketed exclusively by L. E. Frorup & Company, 232 Greenwich Street, New York, N. Y.

The Buckeye Reversible Split Knob.

The Findlay Electric Porcelain Company, Findlay, O., a few years ago placed on the market the Findlay interchangeable, self-centering, split knob, which was described in these columns in the issue of April 6, 1912. This knob met with such favor that the company has now developed a new split knob which will probably still further increase the usefulness of these devices.

It will be observed from the illustrations herewith that the new knob, which is known as the Buckeye, is not only reversible and has both parts exactly alike, but has two wireways in each part, thus making it a two-pole knob in straight wiring and a four-pole knob in cross-over work. The two parts fit together so neatly as to interlock and prevent displacement while installing them. Small projec-

Two Symmetrical Parts of Reversible Split Knob.

tions are provided on the face that engages the wall or other mounting surface to prevent this knob from turning. Either screws or nails may be used to fasten the knobs, as required. The taper of the wireways, together with their transverse ribs, wedge the wire tightly without injuring the insulation. These knobs are made for No. 12 and No. 14 wire. Three sizes are made: 1.125 and 1.25-inch diameter round and 1.125-inch square. All the

Knob Complete.

knobs are made of strong, high-grade porcelain.

Frantz Premier Convention.

Sixty distributors of the Premier Vacuum Cleaner Company from all parts of the country were guests of the company at Cleveland on June 2, 3 and 4. All were enthusiastic over the new plans announced which include the marketing of over 100,000 Frantz Premiers during the next twelve months. Edward L. Frantz, president, announced a reduction in the price and told about the $100,000 advertising campaign which starts immediately in the big magazines.

Mr. Frantz was host at two banquets, one at the Cleveland Athletic Club and the other at the Hollenden Hotel.

The business sessions were interspersed with several open-air luncheons, bathing parties, etc., and the meetings closed with the announcement that the convention would hereafter be an annual affair.

The Premier Vacuum Cleaner Company started business four years ago in a single room with three employees. It now occupies a modern factory and employs 300 men. Last year's output totaled over 60,000 machines.

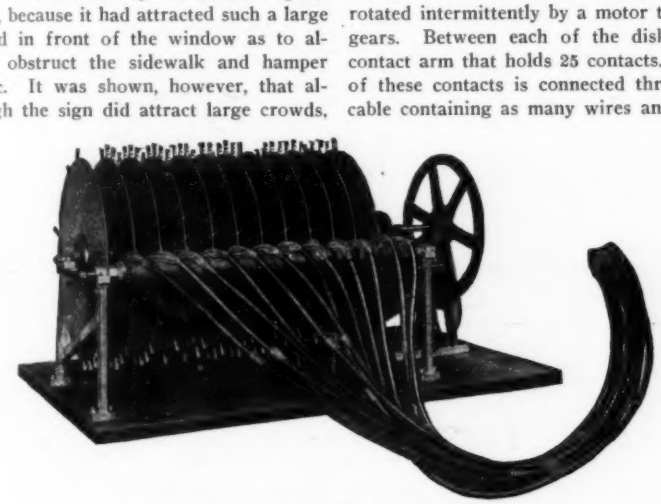
A Talking Window Sign.

A novelty in the way of electrical signs, which is suitable for use in window displays, bulletin boards, train announcers, theater program boards, etc., has been placed on the market by the E-B Electric Sign Company, Incorporated, 209 North Jefferson Street, Chicago. An illustration of one of these signs that was recently installed in the show window of a haberdashery shop in Chicago is shown herewith. This sign had a unique distinction in that shortly after its installation its use was forbidden by the Police Department, because it had attracted such a large crowd in front of the window as to almost obstruct the sidewalk and hamper traffic. It was shown, however, that although the sign did attract large crowds, it did not come within the regulations of the city ordinance prohibiting window shows and sidewalk-obstructing attractions, because the reading matter on the sign was continually repeated after an interval of approximately a minute; the crowds that congregated before the window watched the display for a short time and then moved on, giving room to other spectators, and thereby preventing a complete stationary blockade of the sidewalk, which is prohibited by the municipal ordinance; in other words, it was a moving crowd and was therefore finally permitted.

Talking Window Sign.

This sign can be made up in a variety of forms and sizes. The particular sign shown consists of twelve block spaces suitable for as many changeable letters, each space being three inches high and three inches wide. The front of each of these spaces has a glass cover, sandblasted on the inside. This hides from view 25 small tungsten lamps directly behind the glass plate. These lamps are arranged in five rows of five each, and the principle of the sign consists in lighting selected lamps in such a way as to form any desired letter or figure. The manner in which this is done is shown by the illustration of the flashing or control device which is connected by a series of cables with the sign. The flasher can be placed at some distance from the sign and is automatically operated by motor, so that the entire outfit can be obscured from view. This makes the sign mysterious in its action, and therefore particularly attracting.

The operating device has 12 disks, one for each of the letter plates. These disks are mounted on a common shaft, which is rotated intermittently by a motor through gears. Between each of the disks is a contact arm that holds 25 contacts. Each of these contacts is connected through a cable containing as many wires and leading to the 25 lamps in a letter plate in the sign. Small projections shown sticking beyond the periphery of the sign are known as "letter sticks"; these fit into grooves in the disks and are easily inserted and removed. These letter sticks control the letter or symbol which the corresponding letter plate will show. A standard window sign makes 32 complete changes and then repeats, in other words, there are 32 segments to each disk, each of which may receive a letter stick. The entire group of letter sticks can be set up in half an hour, and the sign is then ready to operate.



Operating Mechanism for Talking Sign.

The lamps are operated at low voltage, the current being obtained by a one-sixth-horsepower rotary converter and step-down transformer. The cost of operation of a twelve-letter sign, such as shown, is in the neighborhood of one cent an hour. There are furnished with each of the twelve-letter signs 600 assorted letter sticks, including letters, figures and characters. There are also furnished several extra tungsten lamps, several blank letter sticks and extra glass covers. The standard length of cable is ten feet. The sign is also equipped with an automatic cut-off, which takes the place of a time switch. The sign is fully equipped, ready for operation, and requires merely mounting in the desired place and connection to an ordinary lighting circuit. Although the standard sign at the present consists of only twelve letter plates, any number of these can be furnished, and they can be grouped in any desired combination. The letter plates also may be of any size desired.

Locomobile Adopts Westinghouse Electric Equipment.

The Locomobile Company of America has adopted the latest Westinghouse electric six-volt starting and lighting equipment for its 1915 models. This consists of generator, starting motor, switch, voltmeter and junction boxes. The main features of this Westinghouse automobile equipment were described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of January 25, 1913.

The lighting generator is especially designed for operation at slow speeds, developing ample output for all lamps, and has splendid characteristics for battery charging. It is of the differentially wound, self-regulating type.

The starting motor is designed for high starting torque and a minimum consumption of current. It is of the series-wound type, the power being applied through a shift pinion. By novel arrangement the sequence of starting operations is practically instantaneous.

The flush-type voltmeter indicates the exact condition of the battery at all times. All lettering on voltmeter scale is white on a black ground, to avoid glare when the meter is illuminated.

By using junction boxes all electrical wiring on the chassis and body is centered at one point, thus facilitating removal of the car body from chassis. All connections, both of the starting and lighting systems, are on single-wire circuits, reducing the wiring to a minimum, and contributing to the efficiency of the electric system.

A Large and Striking Central-Station Sign.

The Commonwealth Edison Company, Chicago, has maintained for several years on the roof of its old Harrison Street station a large electric sign calling attention to Edison light and power service. The sign faces north and is just west of the river, so that it can be readily seen from all of the bridges and adjacent viaducts for about three-quarters of a mile northward. The announcements on the sign have been changed from time to time, principally by substituting the names of large Commonwealth power customers. Recently, however, the sign has been completely remodeled and now presents one of the most strikingly original departures from the usual central-station flashing sign advertising electric power.

A view of the new sign is shown herewith. It has been declared by competent persons to be one of the finest examples of electrical advertising. The size of the sign is remarkable, but it does not appear to be as big as it is, because the nearest approach to it, the Van Buren Street bridge, is a long block north of it. The total length of the sign is 204 feet and its height from top to bottom, 42 feet. The picture portion at the left is 55 feet long. Probably the best idea of its real size can be obtained from the statement that the figures of the two men in the picture portion are 36 feet high each.

This part of the sign is beautifully worked out in color, the effect being secured by Reco color hoods fastened to the individual lamps, as desired, by means of small springs, a system which avoids the necessity of coloring the lamps and is much more economical. The outline of the machine is in green lights around the painted sheet-iron portions. The picture represents the forging of a hot steel bar under a converted steam hammer, the steam having been superseded by compressed air supplied from a compressor driven by an electric motor using central-station energy. The workman at the right holds one end of the large steel bar under the hammer. That portion is set thickly with bright red lamps. The part of the metal adjoining this portion has some amber tips on the lamps indicating a lesser degree of heat. The bright red lamps being very much more noticeable to the eye, they indicate a higher degree of heat.

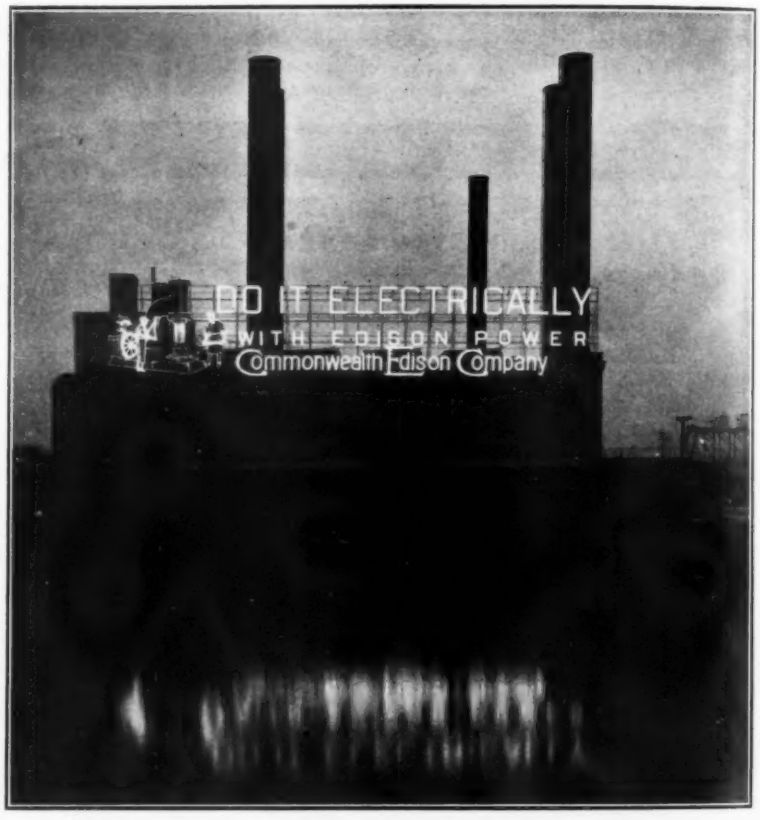
Another clever feature is the careful reproduction of the actual motions of the workman who controls the machine by means of the lever. He stands at the left with his hand on this lever and moves it a very little, once or twice, feeling the pulse of the hammer, just to make sure that the compressed air is working right. This being proved to his satisfaction, the blow is struck. The short try-out movements are not produced for each descent of the hammer, but only as in practice.

The letters in the top line of the reading matter are 12 feet high; those in the two lower lines are 6 feet high. The sign contains 3,617 ten-watt tungsten lamps. The load is nearly 50 horsepower. The total candlepower is 29-300.

The flashing part of the sign contains 1,600 of the lamps, all equipped with colored caps, as follows: green hoods for the outline of the hammer, opal hoods for the hammer and figures of the men, ruby and amber hoods combined for the metal and the sparks.

The complete operation of this "electrical movie" lasts for about ten seconds, the bar being in the anvil for eight seconds and lowered for two seconds, during which time the hammer is constantly in operation. The sparks which fly from the first blow of the hammer constantly decrease as the iron apparently cools.

The flasher for this sign was built by the Reynolds Electric Flasher Manufacturing Company, Chicago. The sign was designed and built by the Federal Sign System (Electric), Chicago.



New Striking Electric Sign on Harrison Street Station, Chicago.

Iron and Steel Industry to Take Prominent Part in Panama-Pacific Exposition.

The iron and steel industry will be given a prominent place among the various attractions at the coming Panama-Pacific International Exposition at San Francisco next year by the comprehensive exhibit of the United States Steel Corporation and subsidiary companies.

A general committee headed by A. T. DeForest of the United States Steel Products Company, of San Francisco, has been directing the work and H. V. Jamison, advertising manager of the American Sheet & Tin Plate Company, of Pittsburgh, who has just been appointed director of exhibits for the entire corporation, is busily engaged mapping out plans for the exhibits of the various companies.

Among the features which will be shown will be one showing the process of manufacturing iron and steel products, from the mines where the ore is taken out of the ground to the production of hundreds of products of the corporation. It is intended to show how the ore is transported both by rail and water, the dock operations, the production of coal, coke and pig iron and thence to the specialized lines of manufacture. The exhibit will even show

how the by-products are produced and will show many of the products in practical use.

A motion-picture show will be part of the exhibit and through this medium will be portrayed the operations of the corporation throughout all its departments. In the pictures will also be shown the great benefit to the social world brought about by the United States Steel Corporation, through its endeavors to further the social welfare of its employees. The corporation's many devices for insuring safety of employees will be exhibited and data will be given as to the enormous amounts expended for this purpose.

This is the first time in the history of the steel industry that the United States Steel Corporation has planned a comprehensive exhibit or display of any kind embracing all of the subsidiary companies. It is certain that this feature of the coming exposition will make a strong appeal to visitors at San Francisco in 1915.

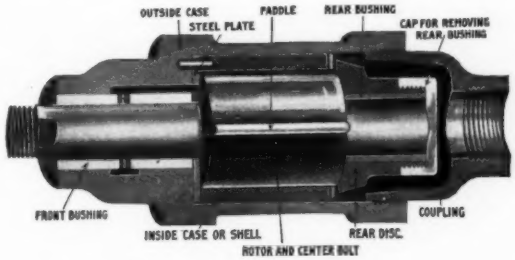
A New Turbine Cleaner for Fire-Tube Boilers.

The illustrations herewith show a new type of air or steam-turbine-driven vibrator knocker head for dislodging scale from the outer surfaces of tubes in return tubular boilers. This cleaner also removes the soot from the inner surfaces of the tubes. The soot is loosened by the vibrating knocker and is blown out of the tube ahead of the cleaner by the steam or air exhausting from the front of the turbine.

The knocker head consists of a cylindrical body somewhat smaller in diameter than the boiler tube and an eccentrically pivoted lever carrying a clover-shaped knocker on a stud at its free end. The lever fits flush into a triangular recess in the forward face of the main body, the free end swinging in an arc through the center of the head. The three hammer faces of the knocker are shaped to fit the inner circumference of the boiler tube, thus giving a greater area of contact with the tube than is possible with former types. This advantage permits the hammer being made heavier and a firmer blow struck without injury to the tubes. The extra weight and force of blow is proving successful in loosening stubborn scale.

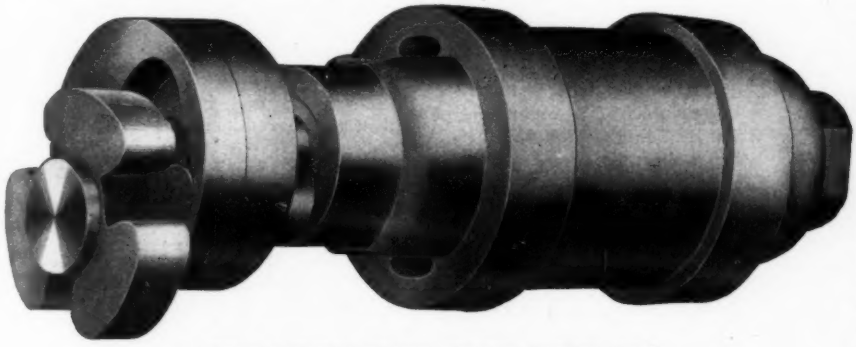
The head is driven at high rotative speeds, the eccentrically pivoted lever carrying the knocker is thrown from side to side and the knocker caused to revolve on its axis at each contact with the tube, giving a resultant gyratory motion to the knocker, causing it to hit all points of the interior circumference of the tube.

The cleaner is fed into the tube by the flexible rubber hose furnishing the air or steam pressure, the revolving motion of the head eliminating the necessity of turning the cleaner by twisting the hose.



Sectional View of Turbine.

The motor for driving the head is intended for either steam or compressed air and is of the rotary-engine type. The air or steam strikes upon radial paddles, giving a high speed to the shaft. The paddles themselves are continually held out by the air or steam which is admitted to a chamber behind the paddles so that they always form a tight fit with the case. The motor has four paddles, two of which are always under pressure, making it impossible for the motor to stall.



Rotor of Turbine Cleaner, Showing Knocker Head.

All wearing parts are made of high-carbon steel carefully tempered and ground to fit. The wear is very slight, but as all parts are machined to jigs, they can be easily replaced.

A specially designed oiling device which is furnished as an extra for these motors, mixes the oil with the air or steam supply, thoroughly blowing it into all the bearings and rubbing parts.

This new turbine tube cleaner is one of the many types of cleaners manufactured by the Lagonda Manufacturing Company, Springfield, O.

Recent Installations of Telephone Train-Dispatching Equipment.

The increasing use of the telephone system of train dispatching by leading railroads of this country and Canada is conclusive proof that its advantages—quickness, the personal relationship factor, and absolute dependability—have become thoroughly appreciated. The telephone greatly simplifies the complex business of the train dispatcher. As a servant the telephone is always ready; as a saver of time and energy it has no equal. Experts agree that it makes for safer, more reliable and more efficient railroading. Through the agency of the telephone discipline is enforced and efficiency increased. When a towerman comes under direct personal supervision of his chief by telephone he is more apt to carry out his orders with care and dispatch than if they are ticked in by the more or less impersonal telegraph sounder. The dispatcher also can increase his range of operation by as much as 50 per cent.

One of the recently equipped lines is the 80-mile circuit on the Western Maryland Railroad between Hagerstown and Cumberland. While this road does not handle many first-class passenger trains a day, the dispatcher has his hands full maneuvering loose engines and freight trains; 1,000 minutes out of the 1,440 in a day his wire is busy with orders governing the movement of approximately 200 trains which come and go over one track. With 15 Western Electric way-station equipments and 30 siding telephones in use the entire line is in constant touch with the dispatcher at the terminal.

The Butte, Anaconda & Pacific Railroad Company, the electric ore-carrying road operating between Butte and Anaconda, Mont., whose power equipment was recently described in these columns, has installed a telephone dispatching system to cover 76 miles of its line. The dispatcher is located at Anaconda and is in communication with 13 stations on the system; 13 locomotives are equipped with telephones, jack boxes being so placed on

the outside of the engine cab that connections can be easily made to the overhead wires by line poles. This road has an unusually fine system overhead construction in its electrical plant, using a No. 10 B & S gauge copper circuit for the telephone line.

On the Chicago & Alton, 29 way-stations between Bloomington and Chicago, and 32 way-stations from Bloomington and St. Louis, will be connected by the latest type of Western Electric selector equipment. The dispatchers for both circuits will be located at Bloomington, Ill.

In addition to the foregoing the Western Electric Company reports the following installations:

The Monroe, N. C., division of the Seaboard Air Line has put into commission within the past few months a system of telephone dispatching to extend over 282 miles. Selectors have been installed at 38 way-stations. About the same number of siding sets have been placed at various points along the line for the use of trainmen.

On the St. Louis Southwestern, from Illmo, Mo., to Jonesboro, Ark., about 136 miles of line has been equipped with 24 selectors and telephone equipment. The dispatcher is located at Illmo.

The Pittsburgh, Shawmut & Northern has extended the 47-mile telephone circuit between St. Mary's and Brookville 53 miles by the equipping of 12 additional way stations.

The Chicago, Milwaukee & St. Paul Railroad Company is preparing for the installation of selectors on a circuit to cover a new division now in the process of construction between Great Falls, Mont., and Lewiston, Idaho, a distance of 137 miles. The number of way stations to be equipped at present is fifteen.

The Southern Electric Development Company, of Saginaw, Mich., is installing a train-dispatching circuit consisting of a dispatch office and nine way stations. This circuit is exclusively for the control of train movements. There is also to be a commercial circuit, consisting of 38 telephones. This is for the handling of commercial business from various offices along the line. Both circuits are 57 miles in length, with the dispatcher's office located about midway in the circuit, at Saginaw. The commercial circuit goes into a Western Electric sectional unit type switchboard at Saginaw, being divided there at the north and south ends of the circuit. A notable feature of this installation is the use of 3,000 feet of submarine cable in Saginaw. Since the city ordinance does not permit the erection of poles. This submarine cable will run along the bed of the Saginaw River within the town proper, forming one end of the train-dispatching circuit.

The Cedar Rapids & Iowa City Railway Company has installed a telephone train-dispatching circuit between Marion and Iowa City, with the train dispatchers' office at Cedar Rapids. The circuit has 14 selectors, 8 distributed on the south end, 2 in Cedar Rapids in the general office and 4 between Cedar Rapids and Marion.

The New York, New Haven & Hartford Railroad is now using telephone train-dispatching equipment on a line between New Haven, Conn., and Springfield, Mass. The distance covered is 60 miles, with the dispatcher located at New Haven.

The Northern Pacific has equipped the line between St. Paul and Staples, a distance of 142 miles, with train and message circuits. Both lines are arranged for simplex telegraph service.

The dispatcher is located at St. Paul. Western Electric telephone jack boxes have also been installed by the road.

The Denver & Rio Grande is now using two circuits, one from Salt Lake City to Helper, 152 miles, and another from Helper to Grand Junction, 177 miles. Dispatching stations are at Salt Lake City and Helper. Both train and message wires run from Salt Lake City to Helper, but only a train wire is in operation from Helper to Grand Junction. On the last mentioned circuit 42 selectors and the necessary telephone apparatus are in commission; 15 selectors of the same type are used on the circuit to Grand Junction.

The Cleveland, Cincinnati, Chicago & St. Louis Railroad (Big Four) will install 70 selectors and equipment over two dispatching circuits. One line is to extend from Kankakee, Ill., to Indianapolis, Ind., covering 144 miles, while the other, from Indianapolis to Springfield, Ill., is of about the same length. The dispatcher is to be located at Indianapolis. The main line of the Alabama, Tennessee & Northern will, within a short time, put into operation 9 selectors over the line between York and Reform; 73 miles of road will be included in the circuit, with the dispatcher at York, Ala.

Artistic New Lighting in Old Theater.

The theater-going public must be pleased not only with the performance but also with physical comfort at the theaters it attends. Realizing this, the Pitt Theater, of Pittsburgh, Pa., recently remodeled the entire house and installed the latest improvements in lighting.

The details are of interest, as there is much theater building going on now owing to the steadily increasing popularity of motion pictures. Illumination for this class of work is special and there is a noteworthy lack of definite information on the subject.

In the following description of the Pitt is given a good example of recent practice in this line.

The main ceiling has three Parian bowls, a 500-watt lamp in each, hanging 20 feet from ceiling. In front of the second balcony are 14 eight-inch Parian acorns with a 40-watt lamp in each. In front of the first balcony are 17 Parian panels with two 16-candle power carbon linolite lamps and Frink reflectors behind each panel. The ceiling over the first balcony has four Parian bowls with 250-watt lamp in each. The second-floor corridor has six bowls each with 150-watt lamp. In the first-floor corridor are five bowls, 250-watt lamp in each.

On the newel post at the foot of the stairs are Parian urns with a 150-watt lamp in each. Under the first balcony are four bowls, 250-watt lamp in each. In the first-floor box eight bowls are used as ceiling lights with three 25-watt round-bulb tungsten lamps in each. The second-floor boxes have eight Parian acorns suspended with arms so that they give the appearance of urns, a 150-watt lamp being in each. The height of the main ceiling is about 40 feet. The floor space of main floor, including corridor, is 80 by 100 feet. The area of the first balcony is about 35 by 100 feet.

The color scheme of the theater is blue and old ivory. The hangings, draperies, etc., dark blue. All the glass work is decorated light blue and old ivory, with a blue band, the fret work on the Grecian band being brought out in blue. For the ladies' retiring room special bowls colored old rose to match the hangings were selected. Frink reflectors are used over the ticket window, around the inner edge of the marquise, and inside the framework of the two billboards in front.

Parian balls are set on the marquise and on the top of the theater. The inside brackets use blue and old-ivory-decorated shades. Special bracket fixtures for mirrors, handle trimmings and silk shades, candlebra fixtures, fire logs, etc., complete the lighting installation which, was furnished throughout by the H. W. Johns-Manville Company, New York City.

The architects, Simpson & Isles, of Pittsburgh, Pa., have received much praise from the management and patrons for the excellent effects they have secured. Formerly with the ordinary fixtures the lamps were exposed and gave the usual disagreeable glare. With the new equipment, beside accomplishing a decided current decrease, not a lamp is visible and the restful comfort and beauty are conspicious.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—Killark Electric Manufacturing Company, 2005 Locust Street, St. Louis, Mo.

"Electrolet." A porcelain fitting having a separate opening for each wire and secured over the end of a piece of conduit by a threaded metal plate.

For use only at an exposed end of conduit (but not under fixture canopies) and only where the conduit wires pass out through the fitting without splice, joint or tap within the fitting.

Approved April 17, 1914.

CUTOUT BASES, CARTRIDGE FUSE. — The Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn.

Slate-base cutouts for N. E. C. inclosed fuses, one, two, three and four-pole.

250 volts, catalog Nos. 2400-05 inclusive, 2408-13 inclusive, 2416-21 inclusive, 2424-29 inclusive.

600 volts, catalog Nos. 2432-36 inclusive, 2440-44 inclusive, 2448-52 inclusive, 2456-60 inclusive.

Approved April 1, 1914.

FIXTURES.—The Bradley & Hubbard Manufacturing Company, Meriden, Conn.

"B. & H." electric and combination fixtures.

Commercial products of this class which are regularly examined and tested under the supervision of Underwriters' Laboratories at the factories where they are produced, bear uniform labels by which they can be identified.

Approved May 7, 1914.

FIXTURE WIRE.—A-A Wire Company, Incorporated, 48 Nesbitt Street, Newark, N. J.

Marking: Two or more olive-green threads parallel with the wire between insulation and braid.

Fixture wires shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved May 8, 1914.

INCUBATORS AND BROODERS. —United Electric Manufacturing Company, 926 La Fayette Street, New Orleans, La.

"Reed's" electric incubator and brooder.

Electrically heated incubators and brooders shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved May 18, 1914.

PANELBOARDS.—United Electric Manufacturing Company, 926 La Fayette Street, New Orleans, La.

125 and 250-volt, two and three-wire boards equipped with knife switches and terminals for cartridge inclosed fuses. Also two and three-wire metering panel, 125-250 volt, when mounted in suitable slate-lined cabinets.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved May 18, 1914.

PANELBOARDS.—The Cleveland Switchboard Company, 430 Prospect Avenue, N. W., Cleveland, O.

Two and three-wire panelboards, 125, 125-250 and 250 volts, with double-pole knife switches in branch circuits, with open-link, Edison plug or cartridge inclosed fuses.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved May 13, 1914.

RECEPTACLES, Standard. — General Electric Company, Schenectady, N. Y.

"G. E." wall sockets, brass shell.

Key, 250 watts, 250 volts.

Catalog Nos. GE247, GE278, GE288, GE527.

Key, 660 watts, 250 volts.

Catalog Nos. GE255, GE281, GE285, GE528.

Keyless, catalog Nos. GE246, GE279, GE283, GE411, GE526.

Pull, catalog Nos. GE254, GE280, GE284, GE529.

Also the above with shadeholders attached.

"G. E." wall sockets and receptacles, porcelain shell.

Conduit box, catalog Nos. GE297-98.

Approved May 15, 1914.

RHEOSTATS. — General Electric Company, Schenectady, N. Y.

Motor starters, types CR-1000, 1102, 1007, 1022, 1025, 1027, 2301, 2303 and starting panels CR-2320, 2322-2326 inclusive, 1100, 1102.

Speed controllers, tyes CR-1314, 1220, 1221, 1224, 1225, 1200, 1240-45 inclusive, control panels CR-1303, 1315, 1320 and (for printing presses) 6010, 6011, 6032, 6033, 6060, 6052, 6106, 6220.

Field rheostats, types CR-8000, 8001. 1226-1228 inclusive, 8132, 8192, 8322, 8390.

Theater dimmers, 9300-9304 inclusive, 9310-9314 inclusive, 9320-9324 inclusive, 9330-9334 inclusive.

Battery charging rheostats, types CR-9200, 9202, 9204.

Resistance units, types CR-9000, 9010, 9042, 9145.

Drum controllers (for industrial service), types CR-3100, 3105, 3110, 3133, 3134, 3136, 3202 (without primary oil-switch attachment), 3204, 3900, also K (for non-grounded circuits).

Types CR-1000, 1100, 1220, 1221, 1224, 1225, 1240-1245 inclusive, starters are approved only when circuit-breakers or fuses are installed in connection with them.

Drum controllers are approved only when properly installed in connection with resistance elements.

Approved April 20, 1914.

SWITCHES, Combination Cutout. **—H. T. Paiste Company,** Thirty-Second and Arch Streets, Philadelphia, Pa.

"Paiste" panel cutout and service-entrance switches, two and three-wire.

Panel cutouts Edison plug-fuse bases and knife switches, 30 amperes, 125 volts, catalog Nos. 4017-19 inclusive, 4021, 5130-49 inclusive.

Approved May 14, 1914.

SWITCHES, Combination Cutout. The Trumbull Electric Manufacturing Company, Plainville, Conn.

Panel cutouts, with or without copper busbars and lugs, 10 amperes, 125 volts; catalog Nos. 385-388 inclusive.

Approved May 2, 1914.

SWITCHES, Fixture.—The Bryant Electric Company, Bridgeport, Conn.

Chandelier switches. Adaptations of the standard Bryant pull-socket mechanism for attachment to threaded stems of canopies, clusters and chandelier bodies.

Canopy switches, 1 ampere, 250 volts, 3 amperes, 125 volts; catalog Nos. 491-92.

Approved April 29, 1914.

SWITCHES, Push-Botton Flush.—Chapman & Walker, Limited, Submitters, Manufactured by Sterling Telephone & Electric Company, Limited, 210-212 Tottenham Court Road, London, West, England.

Double-pole, 10 amperes, 250 volts; catalog No. A-232.

Three-way, 10 amperes, 125 volts, 5 amperes 250 volts; catalog No. A-233.

Approved May 16, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

NEW HAVEN, CONN.—A permit to build a big new power house station in New Haven at a cost of $90,000 has been granted by the building department to the United Illuminating Company. The new building means an important extension to the company's plant in this city, according to President James English, who said the new station will not replace the old one but will add to it.

CLYDE, N. Y.—The proposition to raise $400 for ornamental lighting for the village park and extra lights in the outskirts of the village carried. Address Engineer J. T. Lawyer for desired information.

SPENCERPORT, N. Y.—At the special election, held in this village, an appropriation of $16,000 to install a system of electricity has been decided upon.

BAYONNE, N. J.—The Common Council has passed a resolution providing for a referendum on the ballots at the next election for the establishment of a municipal electric lighting plant. A.

NEWARK, N. J.—The Public Service Electric Company is considering the installation of an underground conduit system along Orange Street, from Broad Street to the East Orange line, supplanting its present overhead lines. A.

PENNINGTON, N. J.—The Hopewell Township Committee is considering the installation of a lighting system on Pennington Road. The improvement will be made by the Public Service Company. A.

NEW HOPE, PA.—The Bucks County Electric Company has made application for a franchise for the construction and operation of an electric light and power system throughout the borough. A.

PITTSBURGH, PA.—Plans are being made by the Citizens' Light, Heat & Power Company, of Johnstown, Pa., to establish a great central power plant near Seward, Pa. The company has acquired rights on a small stream near Seward and many acres of land are said to be under option. The site has been selected in the heart of a new coal field recently opened up and the purpose is to have the coal conveyed directly from the mine to the boilers, by means of a short haulage system, which would be electrically equipped. The location will afford easy access for power lines to Blairsville and other points and will cause Seward to become the center of that region. S.

SOUTH ATLANTIC STATES.

GARY, W. VA.—The Tug River Power Company, recently incorporated here by J. J. Stout, G. C. Sledge, J. H. Barker, G. W. Kanode and H. N. Eavenson, plans to construct a hydroelectric power plant to furnish current to municipalities and factories in this section. The capitalization of the company is $10,000. L.

ABINGDON, VA.—A large dam and power plant will be erected at the middle fork of the Holston River near here by the Abingdon Water & Light Company. This company was given a 30-year franchise by the City Council to furnish day and night current.

PROSPERITY, S. C.—The city will construct electric light system at a cost of $10,000. J. B. McCrary Company, Atlanta, Ga., has prepared the plans.

NORTH CENTRAL STATES.

CINCINNATI, O.—The Andrew Jergens Company is preparing to construct a four-story office and factory building on the south side of Alfred Street, west of Spring Grove Avenue, adjoining its present large plant, and will require a large amount of electrical equipment, both in the way of transmission equipment and motors for the operation of machinery. The structure will be of concrete, 99 by 120 feet, and will cost $45,000.

CINCINNATI, O.—The N. Manichewitz Company, Eighth Street and the C. H. & D. Railroad, will build a four-story addition to its factory, which will require a number of motors and other electrical equipment. Architect Harry Price has the plans. L.

GOSHEN, IND.—The Indiana Public Service Commission has granted the petition of the Hawks Electric Company for extending electric lines to Waterford and New Paris. The corporation is now engaged in buying the necessary right of way.

UNIONDALE, IND.—Uniondale is to receive electric light and power service from the Fort Wayne and Northern Indiana Traction Company, if plans proposed by the company are accepted. A power line will be built from the company's right of way near Kingsland, to Uniondale.

AURORA, ILL.—The contracts for electric wiring, plumbing and heating for the new City Hospital at Aurora, Ill., are to be let shortly. The contract for the general construction work on the new building was let to W. H. Graham, an Aurora contractor, for $65,585. Worst & Shepardson are the architects. Z.

CLINTON, ILL.—There is considerable talk here of building a municipal electric light plant and it is likely that such a proposition will be shortly submitted to the voters. Z.

MOLINE, ILL.—The contracts for the electric wiring, heating and plumbing for the new fire station to be built by the city of Moline will shortly be let. E. L. Eastman, Commissioner of Public Health and Safety, is in charge of the work.

BATTLE CREEK, MICH.—The Commonwealth Power Company will extend its lines to the Urbandale suburb. Address R. R. Thompson, superintendent.

LANSING, MICH.—The Northern Michigan Power Company, a foreign corporation incorporated in Maine with headquarters at Portland and New York City, has filed articles of incorporation, capitalized at $6,000,000. This will give the company permission to do business in Michigan.

LAURIUM, MICH.—The present lighting system is inadequate, and as the present contract with the Houghton County Electric Light Company expires this month, it is expected improvements will be made.

MILWAUKEE, WIS.—Twelfth Street merchants in the vicinity bounded by Vliet and Walnut Streets are investigating better street lighting. At the meeting of the Twelfth Street Advancement Association, a committee for the purpose was appointed. It consists of Ernst Demin, Jacob Poss, William Klug, Louis Scheich and Aloys Knoernschild.

TREMPELEAU, WIS.—$8,000 electric light bonds have been voted and work on the new plant will be commenced at once. It is thought that the city will be supplied with electric light by the first of August. The Wisconsin Railway, Light & Power Company, of Hatfield, will furnish the power. The city will own and operate the plant.

COTTONWOOD, MINN.—An electric light franchise was granted to Velat and Michal, of St. Paul.

ROCKFORD, MINN.—The Council is considering installing a new lighting system.

TAYLOR, N. D.—An electric light will be installed here.

SIOUX FALLS, S. D.—An improved lighting system for the business district of Sioux Falls, which is being agitated by the business men now seems a certainty. The plan includes the installation of 127 new curb lights.

DES MOINES, IOWA.—Plans are being prepared by the Des Moines Electric Company for construction of a high-tension transmission line to Oskaloosa, covering all intervening and surrounding towns. Cost $200,000. Address W. H. Thompson, general manager.

ESTHERVILLE, IOWA.—$60,000 will be spent for more lights and water.

KANSAS CITY, MO.—The ordinance providing for the installation of 56 ornamental electric light and trolley poles on Main Street between Fifteenth and Twentieth carried at a meeting of the City Council on June 17. R. L. Gregory is chairman of the Board of Public Works. M.

SALINA, KANS.—The Salina Heat & Power Company is arranging for improvements to its plant. New boilers and switchboards will be purchased. J. E. Harsh is manager of the company.

SOUTH CENTRAL STATES.

BURLINGTON, KY.—The Walton Electric Light Company is installing a lighting and power plant here. H. W. Mayfield is interested in the improvement. G.

ELSMERE, KENTON COUNTY, KY.—Several bids are under consideration by the town board of Elsmere for the construction of an electric light plant and its operation. The trustees passed the franchise ordinance last month and will let a contract to the best bidder for an initial period of ten years. G.

LEXINGTON, KY.—An ornamental lighting system will be installed in the business section. Address the mayor for particulars.

LOUISVILLE, KY. — Complete plans for the building of a new addition to the big power station of the Louisville Gas & Electric Company were announced. The addition according to estimates furnished the company will cost at least $500,000. The plans and specifications call for the erection of brick and concrete building, equipped with the most modern machinery for the manufacture of electricity.

OOLTEWAH, TENN.—The citizens of Ooltewah are much enthused over the prospects and assurance of having in the near future electric lights and the possibility of water works. Several prominent men have taken steps to have the matter urged before the people for a vote.

SPRINGFIELD, TENN.—The City Commissioners contemplate improving electric light plant and $10,000 in bonds will be issued. Address the city clerk for general information.

CUERO, TEX.—The Texas Southern Electrical Company, which is a Boston, Mass., concern, has purchased the electric light and power plants at Cuero, Beeville, Victoria, Bishop and Kingsville and is negotiating for several other similar plants in southern Texas. The company has also taken over the rights and franchises of the Cuero Light & Power Company which were recently granted by the Legislature for the construction of a series of dams across the Guadalupe River and the installation of hydroelectric plants. It purposes also to construct an extensive system of interurban electric railways to connect the different towns where it has holdings. D.

HOUSTON, TEX.—The Houston Electric Company has increased its capital stock from $4,000,000 to $6,000,000 and will make improvements to its property here.

SAN ANTONIO, TEX.—J. N. Brown, president of the Alamo National Bank, is organizing the Guadalupe Water Power Company, which is capitalized at $1,000,000.

WESTERN STATES.

LOVELAND, COLO.—A committee has been appointed to secure ways and means to establish a municipal lighting plant. It is estimated that the plant will cost about $1,000,000.

SAFFORD, ARIZ.—The electric light plant here was completely destroyed by fire, and work of erecting another plant will be commenced at once.

PROVO, UTAH.—Certificate of the incorporation of the Southern Utah Power Company has been filed with the County Clerk. The company is organized under the laws of Delaware with Wilmington as the main office. A. L. Woodhouse is the president, H. R. Waldo, secretary and treasurer, and W. L. Biersach, the agent of the company for Utah. Provo is named as the principal place of business in this state. The authorized capital stock of the company is 600,000 shares at the par value of $1.00 each. The company is organized for the purpose of taking over and operating the properties of L. L. Nunn in Sevier County which have been formerly operating under the name of the Beaver River Power Company.

GOLDENDALE, WASH.—The Pacific Light & Power Company has been granted a 50-year franchise here.

NORTH YAKIMA, WASH.—The Yakima Central Heating Company is petitioning the City Commissioners for a 40-year electric light and power franchise, the company promising to expend $188,000 if the franchise is granted. The terms have not been agreed upon as yet, as the Commissioners want more compensation. The company will not agree to give more than one-half of one per cent at any time. O.

SEATTLE, WASH.—The City Council has declared its intentions of installing a cluster lighting system on Madison, Marion, and Columbia Streets, west of First Avenue, also on Railroad Avenue. Bids will be received for this work by the Board of Public Works, A. L. Valentine, chairman, shortly. O.

VANCOUVER, WASH.—The North Bank Railroad is planning to electrify its road from Vancouver to Portland and use heavy motors instead of engines to handle the traffic between the two cities. Address the general manager at Vancouver.

AUMSVILLE, ORE.—At a special election recently, on an electric-light franchise, the measure carried by a large majority, and the Aumsville Flour Mills Company will shortly begin the construction of an electric light and power plant. The plant will be one of the best small plants in the state, and will furnish light and power to Aumsville and nearby territory. O.

EUGENE, ORE.—The City of Eugene will receive bids shortly for the installation of a cluster lighting system on Olive Street, between Fifth and Ninth Avenues, and on Eighth Avenue, between Willamette and Lincoln Streets. The work entails the expenditure of approximately $5,000. O.

MAPLETON, ORE.—R. H. Clow was today granted the right to maintain and operate a power distributing system at Mapleton. He is building a dam and power plant on the creek which flows through the city and proposes to sell electric power and lighting.

LINDSAY, CAL.—The Tulare County Power Company will issue $1,000,000 six-per-cent bonds to be used in constructing and erecting main lines and extensions, adding to its steam plant and equipping the same and to purchase machinery to equip a hydroelectric generating plant on the Tule River. Address A. M. Drew, attorney.

REDDING, CAL.—Charles Kornel, of San Francisco, construction engineer for the California Power & Manufacturing Company, which is to develop the Fall River section, passed through Redding recently on his way to the scene of construction for the first time. The project of the company calls for an investment of about $40,000, including the construction of a power plant and the installation of 20 miles of transmission line.

SANTA BARBARA, CAL.—The Santa Barbara Gas & Electric Company has agreed to complete a power line to Carpinteria within 30 days. It is planned to light the coast highway from the top of Ortega Hill to the Ventura County line.

PROPOSALS.

FIRE-ALARM BOXES.—Sealed proposals will be received at the office of the purchasing agent of the city of Portland, until June 26, for furnishing the city with 35 positive noninterfering successive fire-alarm telegraph boxes, according to specifications on file in the office of the purchasing agent. Check for 10 per cent of proposal, payable to city of Portland, Ore., is required.

ELECTRICALLY OPERATED CENTRIFUGAL PUMPS.—On June 23 bids will be received for the erection in place of three electrically operated centrifugal pumps, each to have a capacity of 2,800 gallons per minute when operating against a total head of eight feet. Address Frank V. Guthrie, clerk of the Board of Public Works, Logansport, Ind.

LEASE OF ELECTRIC POWER PLANT.—Sealed proposals will be received at the office of the United States Reclamation Service, Fallon, Nev., until June 25 for the lease from the United States of the electric power plant at Lahontan, Truckee-Carson project, Nevada. For particulars address the United States Reclamation Service at Washington, D. C., Fallon, Nev., or 605 Federal Building, Los Angeles, Cal.

VERTICAL ALTERNATING-CURRENT GENERATOR.—Sealed proposals will be received at the office of the United States Reclamation Service, Los Angeles, Cal., until July 14 for furnishing a three-phase 25-cycle 2,300-volt vertical generator, giving an output of 4,000 kilowatts at 80 per cent power-factor. Prospective bidders should write for specifications No. 272 to either the Los Angeles or Washington offices of the Reclamation Service.

VARIABLE-HEAD TURBINE.—Sealed proposals will be received at the office of the United States Reclamation Service, Los Angeles, Cal., until July 14 for furnishing a variable-head turbine for the Roosevelt power plant, Salt River project, Ariz. The machine must run at heads ranging from 90 to 220 feet and should give its best efficiency with an output of 5,650 horsepower at 160 feet effective head. Prospective bidders should write for specifications No. 271 to the Los Angeles or Washington offices of the Reclamation Service.

INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until July 14 for furnishing the interior lighting fixtures for a two-story building for the post office at Covington, Va.; until July 16 for furnishing the same for a two-story building for the post office at Delavan, Wis.; until July 21 for the same for a two-story building for the post office at Jennings, La., in accordance with drawings and specifications, copies of which may be obtained from the custodians of the sites named or the office of the Supervising Architect.

FINANCIAL NOTES.

At the annual meeting of the Montreal Water & Power Company, former directors and officers were re-elected.

At the annual meeting of stockholders of the Rochester Electric Railroad, A. H. Smith, president of the New York Central, was elected a director, vice W. C. Brown, resigned. Other retiring directors were re-elected.

The Westinghouse Electric & Manufacturing Company, at its annual meeting, elected John R. McCune, H. H. Westinghouse, Paul D. Cravath and James N. Wallace to fill the vacancies caused by resignations and deaths in the board.

The Fort Worth Southern Traction Company, under the management of Stone & Webster, has received permission to change its name to the Tarrant County Traction Company, and has increased its capital stock from $1,500,000 to $2,500,000. The company will build and operate the interurban line between Fort Worth and Denton.

A. B. Leach & Company, New York, have purchased $3,300,000 Virginia Power Company first-mortgage five-per-cent bonds, and will offer these bonds at an early date. The electric generating plant built by the Virginia Power Company has recently begun supplying electricity to the coal mines in the Kanawha-New River district of West Virginia. The plant is about fifteen miles from Charleston, W. Va., on the Kanawha River, and its transmission and distribution lines are about 129 miles long.

Announcement is made that the Youngstown & Sharon Street Railway Company, the Youngstown Park & Falls Street Railway Company, Mahoning Valley Railway Company, Youngstown Consolidated Gas & Electric Company, Mahoning & Southeastern Railway Company and the Poland Street Railway Company will be consolidated and operated under the name of the Mahoning & Shenango Railway & Light Company. The move is made in order to obtain better transportation facilities and to effect economies in operation. All the companies thus consolidated are operating subsidiaries of the Republic Railway & Light Company.

The Ohio Public Utilities Commission has approved the issue of $400,000 five-per-cent first-mortgage bonds and $300,000 common stock by the Chardon, Jefferson & Meadville Interurban Railway Company for the purpose of financing the construction of an electric railway between Chardon and Jefferson, a distance of 30 miles. Bonds and stocks are each to be sold at not less than 80.

Plans for the reorganization of the Chicago & Milwaukee Electric Railroad Company are now being worked out and are expected to be completed soon after July 1. A judicial sale of the properties will be made shortly under the receivers, winding up all legal formalities preliminary to the actual reorganization. The company has been in the hands of receivers for several years, reorganization being held up by protests of a small minority of bonds. The reorganization committee controls 98 per cent of the Illinois division five-per-cent bonds of 1922 and 96 per cent of the Wisconsin division five-per-cent bonds of 1925. Under the former reorganization plan the proposed new bond issue was to have been underwritten by the National City Bank and Samuel Insull was to have been chairman of the board of directors of the new company and was to have used his influence to secure a trackage agreement with the Northwestern Elevated by which Chicago & Milwaukee Electric cars would have a downtown entrance into Chicago. It is probable that the reorganization will be carried out along lines originally planned, with changes which may be made necessary by present financial conditions.

The management of the Pacific Gas & Electric Company has mailed to stockholders of the company plans for refinancing the company so as to provide for present and future requirements. The plan involves an amendment to the company's charter reclassifying the capital stock into $100,000,000 common and $50,000,000 first preferred six-per-cent cumulative and $10,000,000 of the present preferred making the total, as at present, $160,000,000.

The report of the Northern Ohio Traction & Light Company for the month of May, shows very satisfactory business and revenues, as compared with May, 1913, as there was an increase in gross passenger earnings of $22,409, the amount being $254,365. This made the increase for the first five months of the year $92,806, which is considered excellent in view of the presence of many unfavorable factors.

Dividends.

	Term	Rate	Payable	
Am. Cities	S-A	3%	July	1
Am. Gas & Elec	Q	2%	July	1
Am. Gas & Elec	Q	1.5%	August	1
Ashev. Pr. & Lt. pf.	Q	1.75%	July	1
Bangor Ry. & El. pf.	Q	1.75%	July	1
Bell Tel. (Can.)	Q	2%	July	15
Cal. Ry. & Pr. pf.	Q	2%	June	10
Cal. Ry. & Pr. prior pf.	Q	1.75%	July	1
Can. Gen. Elec.	Q	1.75%	July	1
Can. Westhse.	Q	1.75%	July	10
Capital Traction	Q	1.5%	July	1
Caro. Pr. & Lt. pf.	Q	1.75%	July	1
Cinn. Gas & Elec.	Q	1.25%	July	1
Cinn. St. Ry.	Q	1.5%	July	1
Cinn. & Sub. B. Tel.	Q	2.5%	July	1
Cleveland Ry.	Q	1.5%	July	1
Col. Ry. Pr. & Lt. pf.	Q	1.5%	July	1
Consum. Pr. pf.	Q	1.5%	July	1
Demerara El. Ltd.	Q	1%	July	2
East Texas Elec.	S-A	3%	July	1
E. L. & P. of Abington	Q	4%	July	1
Illinois Trac. pf.	Q	1.5%	July	1
Inter. Rap. Tran.	—	5%	July	1
Nor. Ohio Trac.	Q	1.5%	July	1
Otis Elevator	Q	1.25%	July	15
Otis Elevator pf.	Q	1.5%	July	15
Ot'wa Lt., Ht. & Pr.	Q	2%	July	1
Providence Tel.	Q	1%	July	1
Puget S. Tr., Lt. & Pr.	Q	1%	July	15
Puget S. Tr., Lt. & Pr. pf.	Q	1.5%	July	15
Toronto St. Ry.	Q	2%	July	2
Trinidad Elec.	Q	1.25%	July	10
Unit. Utilities pf.	Q	1.75%	July	1
West End St. Ry.	Q	$2	July	1
Western Union Tel.	Q	1%	July	15

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 15.	June 8.
American Tel. & Tel. (New York)	123¼	123¼
Commonwealth Edison (Chicago)	136	135½
Edison Electric Illuminating (Boston)	250	250
Electric Storage Battery common (Philadelphia)	52	52
Electric Storage Battery preferred (Philadelphia)	52	52
General Electric (New York)	148¼	148
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	12	11½
Massachusetts Electric preferred (Boston)	62	58⅝
National Carbon common (Chicago)	113¼	110½
National Carbon preferred (Chicago)	119	118
New England Telephone (Boston)	25¼	25⅝
Philadelphia Electric (Philadelphia)	25¼	25⅞
Postal Telegraph and Cables common (New York)	80¼	81¼
Postal Telegraph and Cables preferred (New York)	67½	68½
Western Union (New York)	61¾	61¾
Westinghouse common (New York)	76¼	76½
Westinghouse preferred (New York)	124	124

FOREIGN TRADE OPPORTUNITIES.

[Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Custom-house, New York, N. Y., 629 Federal Building, Chicago, Ill., Association of Commerce Building, New Orleans, La., and 310 Custom-house, San Francisco, Cal. Apply for addresses in letter form, giving file numbers.]

No. 13,181. CHASSIS AND ELECTRIC MOTOR CAR.—Tenders are invited by the Wellington City Council, Wellington, New Zealand, for the supply and delivery of an electric chassis for a 2,000-pound parcel delivery van and an electric motor car, required for the Electric Tramways Department. Copies of the specifications, etc., may be obtained from the office of the Tramways and Electrical Engineer, Harris Street, Wellington, on payment for each of the contracts of $5.11, which will be refunded upon receipt of a bona fide tender. Bids must be submitted by July 9, and local representation is necessary.

NO. 13202. HOUSE TELEPHONE APPARATUS.—A report from an American consular officer states that the manager of a private telephone installation concern in France desires to enter into business relations with American manufacturers of house telephone apparatus. Correspondence may be in English.

NO. 13209. ELECTRICAL APPARATUS AND INDUSTRIAL GOODS.—An American consul reports that a local business house handling electrical apparatus, ventilating fans, vacuum cleaners, X-ray apparatus, etc., desires direct correspondence with American manufacturers of these articles.

NEW PUBLICATIONS.

ELECTRIC TOURING.—The New York Electric Vehicle Association has issued a booklet presenting a number of electric automobile tours in New York, New Jersey and Connecticut. A map of the roads is included and tours are given to Morristown, Lakewood, Trenton, Oyster Bay, Bay Shore, Poughkeepsie and New Haven.

INSULATED RETURN FEEDERS.—A report by A. F. Ganz, F. N. Waterman, Samuel S. Wyer, H. S. Warren and Elam Miller on the insulated-return-feeder system for mitigating electrolysis installed by the United Railways Company of St. Louis, Mo., in the Ann Avenue Substation district, has been printed. It describes the tests made and shows satisfactory results.

ELECTRIC RAILWAY MANUAL.—The thirty-first annual number of the the McGraw Electric Railway Manual has been issued by the McGraw Publishing Company, Incorporated, 239 West Thirty-ninth Street, New York City. It contains full statistics of the electric railways of the United States, Canada, Cuba and the West Indies, with maps of the more important systems. It has been edited by Frederic Nicholas.

PERSONAL MENTION.

MR. WILLIAM S. SAMUEL, of the contracting firm of Kingsbury Samuel Electric Company, Baltimore, Md., was married on June 7 to Miss Carrie Bass.

MR. P. E. HAYNES, formerly with the Department of Gas and Electricity, Chicago, Ill., has resigned and will undertake research work for the Linde Liquid Air Company, in New York City.

MR. M. McINTYRE has been appointed traffic manager of the Central California Traction Company, Stockton, Cal., taking the position from which Mr. S. W. Barnes recently resigned.

MR. WAYNE D. JONES has resigned as electrical engineer of the Spring City (Pa.) Institution for Epileptics and Feeble Minded to become superintendent of the Phoenix Water Power Company, Phoenixville, Pa.

MR. W. T. WALLACE, of the firm of Sanderson & Porter, the newly appointed general manager of the Great Shoshone & Twin Falls Power Company, Twin Falls, Idaho, has assumed office and has the reorganization plans for this company well under way.

MR. I. F. SHANNON, secretary of the Board of Public Works and treasurer of the municipal electric light and water plant at Carthage, Mo., has tendered his resignation and will leave shortly for Roanoke, Va. His successor has not yet been selected.

MR. W. A. McGOVERN, formerly assistant division superintendent at Pocatello, Idaho, of the Oregon Short Line, has been appointed general manager of the Northern Electric Company, of Sacramento, Cal., to fill a vacancy created by the resignation of A. D. Schindler.

MR. S. F. DIBBLE, who for 17 years has been manager of the small-motor department in the Chicago office of the General Electric Company, has been appointed manager of the Duluth office of

S. F. Dibble.

the company and will assume his new duties during the present month. Mr. Dibble was graduated from the University of Michigan in 1893 and was the representative of the General Electric Company at its exhibit at the Columbian Exposition in Chicago in that year. He afterwards served four years as chief electrician of the Public Lighting Commission in Detroit, Mich.

MR. BERTRAM SMITH, assistant manager of the Pacific Coast Division of the Edison Storage Battery Company, was in Butte, Mont., recently in connection with some orders for electric truck sprinklers and fire equipment which are under consideration by the Butte City Council.

MR. A. E. BARKER, founder and for many years active head of the Dean Electric Company, Elyria, O., and for a long time actively engaged in telephone promotion work, has become affiliated with Dodge Brothers, of Detroit, Mich. Mr. Barker will be the Cleveland district representative for the company, and will be in charge of sales in sections of Ohio,

A. E. Barker.

New York, Pennsylvania, West Virginia and Maryland. Announcement will be made respecting the Dodge Brothers' motor car and policy in the near future.

DR. WILLIAM McCLELLAN, of New York City, presided at the second annual conference of Associated Pennsylvania Clubs, which was held at Chicago on June 11 and 12. Dr. McClellan is an enthusiastic alumnus of the University of Pennsylvania and this is the second conference at which he has presided.

MR. F. H. BARBER, sales manager of the Western Electric Company in Salt Lake City, Utah, has been transferred to the company's office at Dallas, Tex., where he will take charge of the sales department. Mr. Barber has been connected with the electrical industry in Salt Lake City for the past four or five years and leaves there a host of friends.

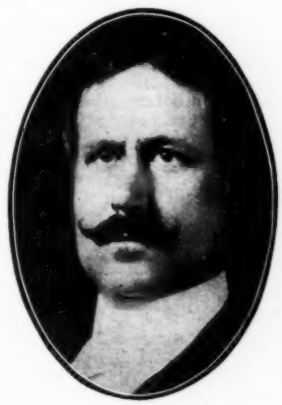
SIR WILLIAM MARCONI has been awarded the Albert Medal for the current year "for services in the development and practical application of wireless telegraphy" by the Council of the Royal Society of Arts, with the approval of its president, the Duke of Connaught. The medal was instituted in 1862. The first medal was given to Sir Rowland Hill.

MR. R. W. TAVEY, an engineer of the National Lamp Works of General Electric Company is in Salt Lake City, Utah. Mr. Tavey is making a tour of the western states, visiting all of the Western Electric Company offices in that territory with special reference to the introduction of the Type C or gas-filled Mazda lamp. He reports that it is taxing the capacity of the factories to supply the demand for this unit, which is meeting with especial favor for exterior lighting purposes.

DR. HAROLD PENDER, professor of electrical enginering at Massachusetts Institute of Technology, has been appointed professor-in-charge of the Department of Electrical Engineering at the University of Pennsylvania, to become effective next fall. Heretofore the Departments of Mechanical and Electrical Engineering at the University of Pennsylvania have been under the direction of the Whitney professor of dynamical engineering. Beginning next year the Department of Electrical Engineering will be on an independent and co-ordinate footing with the Departments of Civil and Mechanical Engineering.

MR. E. P. DILLON and MR. M. B. LAMBERT have been appointed to the newly created positions of assistant managers of the railway and lighting department of the Westinghouse Electric & Manufacturing Company. This is in connection with the work of railroad electrification and heavy power-house apparatus. Mr. Dillon will have charge of the commercial activities of the company in connection with the generation and distribution of power, involving power houses, substations, transformer stations and similar apparatus. Mr. Lambert will have charge of all sales work pertaining to electric traction, including steam, interurban and city railway propositions. Both Mr. Dillon and Mr. Lambert have been connected with the railway and lighting department of the Westinghouse Company for a number of years and are widely known in the electric profession.

MR. FREDERICK A. SCHEFFLER, who has just been elected president of the New York Electrical Society, is one of the best known men among the pioneers of the electrical industry. He was associated in the early days with Thomas A. Edison, in 1881 as engineer, and designed the second electric locomotive Mr. Edison built for experimental purposes at Menlo Park, N. J. Mr. Scheffler has held many important positions in the electrical industry, being at one time general superintendent of the Westinghouse Electric & Manufacturing Company's works at Pittsburgh, general superintendent of the Brush Electric Company's



F. A. Scheffler.

works at Cleveland, O., and manager of the factory of the Sprague Electric Works at Watsessing, N. J. Mr. Scheffler was early connected with the introduction and sale of the Stirling boiler, now manufactured by the Babcock & Wilcox Company, with which firm he is now associated. He is a member of the American Institute of Electrical Engineers, of the American Society of Mechanical Engineers and of the Engineers' Club of New York.

MR. GEORGE BARTON MULDAUR will shortly leave the staff of Barclay Parsons & Klapp to take the position of field representative with the Society for Electrical Development. Mr. Muldaur was graduated from Stevens Institute of Technology in 1889 and gained his first electrical experience with the Edison Electric Illuminating Company of New York. He was associate editor of the *Electrical Engineer* under T. C. Martin for several years and in 1893 was sent as fair editor to the Columbian Exposition at Chicago. He has had experience in the financial and commercial end of engineering and manufacturing enterprises and recently has specialized, chiefly in the South and Southwest, as a development engineer in connection with new railway, light and power companies. Mr. Muldaur's wide acquaintance in the industrial field and his general knowledge of the entire electrical industry fit him for the work he will undertake with the Society for Electrical Development.

OBITUARY.

MR. A. BRUCE ANDERSON, chairman of the British Electrical and Allied Manufacturers' Association, was one of those who lost their lives when the ill-fated *Empress of Ireland* sank in the St. Lawrence River on May 29. Mr. Anderson was managing director of Ferranti Limited, a director of Bruce Peebles & Company, Limited, had a member of the council of the Institution of Electrical Engineers.

MR. ALBERT SHERMAN, superintendent of transportation of the Saginaw-Bay City Railway Company, and a resident of Saginaw, Mich., for several years, met death recently by what indications seem to have been foul play. His partly decomposed body was found at Moyles' Corners some days after he had left Saginaw to visit his brother-in-law, Mr. Jacob Strub, electrical inspector of Toledo, O.; the body was bruised and cut. Mr. Sherman was 52 years old and left a wife and two children. He formerly resided at Toledo.

MR. JAMES J. ROBISON, one of the traction pioneers of the Middle West, died in Toledo, O., June 11, of apoplexy at the age of 59 years. He is survived by a wife, two sons and a daughter. With his father and brother he organized the Toledo Street Railway Company in 1888, this being one of the pioneer systems adopting motor power in the Middle West. Mr. Robison was identified with the company as general manager until the concern was absorbed by the Toledo Traction Company, now the Toledo Railways & Light Company. Mr. Robison was also connected with steam railroads and was instrumental in organizng the company which built the 35-mile Toledo belt railway, which at the time was the only complete city belt railroad in the United States. In addition to these interests, he was connected with many business enterprises and at the time of his death was president of the Ohio Savings Bank & Trust Company.

MR. JAMES CAMPBELL, one of the most prominent men in the development of railroads and public utilities in the United States, and for some time president of the North American Company, died on June 12, at the age of 67 years, at his summer home at Indian Field near Greenwich, Conn. Three weeks ago he was operated on by Drs. Delafield and Rundequest, of New York, for a carbuncle on his neck. Pneumonia developed later and caused his death. Mr. Campbell was born in Ireland, and when he was two years old his parents came to this country, settling in West Virginia. He went to school until he was 11 years old, and then took a job as a grocer's clerk. At that time he became a protegé of General Fremont, who employed him as his special messenger and aid for many years. It was through General Fremont's instrumentality that the boy was placed in the engineering department of the Southwest Pacific Railroad, which ran 50 miles out of St. Louis, and was projected as a link on a new transcontinental railroad. He worked as assistant surveyor and by self-education equipped himself to become head of an engineering corps. Later he was appointed chief engineer of the Kansas City, Missouri & Mobile Railroad, which later became a part of the Frisco system. He bought up the bonds of a number of counties in Missouri which were in default in 1873. Railroad building restoring prosperity in the state, he soon reaped immense profits. In 1877, he opened a brokerage office in St. Louis and purchased the franchise of the Bellefontaine line, transforming it from a mule car line to an electric line, and building up a very valuable property. After that he continued to acquire public utilities until, when he quit active business a few years ago, he controlled practically all of the public utilities of St. Louis. He entered the field of railroad building and operation, and became interested in a number of electric roads and was a pioneer in the field of supplying heat, light and power by electricity. He acquired a large interest in the St. Louis & San Francisco Railroad, becoming vice-president. He later became president and was at his death chairman of the board of directors of the North American Company.

DATES AHEAD.

Minnesota Electrical Contractors' Association. Annual convention, St. Paul, Minn., June 22. Secretary, G. M. Jones, 14 North Seventh Street, Minneapolis, Minn.

American Institute of Electrical Engineers. Thirty-first annual convention, Hotel Ponchartrain, Detroit, Mich., June 22-26. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

Society for the Promotion of Engineering Education. Twenty-second annual meeting, Princeton, N. J., June 23-26. Secretary, Henry H. Norris, Ithaca, N. Y.

Canadian Electrical Association. Annual convention, Montreal, Canada, June 24-26. Secretary, H. G. Martin, Toronto, Ont.

American Society for Testing Materials. Seventeenth annual meeting, Atlantic City, N. J., June 30-July 4. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

National Electrical Contractors' Association of the United States. Annual convention, Cadillac Hotel, Detroit, Mich., July 15-18. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 21-24. Secretary, D. L. Gaskill, Greenville, O.

Southeastern Section, National Electric Light Association. Annual convention, Isle of Palms, Charleston, S. C., August 19-21. Secretary, A. A. Wilbur, Columbus, Ga.

American Peat Society. Annual meeting, Duluth, Minn., August 20-22. Secretary, Julius Bordello, 17 Battery Place, New York, N. Y.

New England Section of the National Electric Light Association. Sixth annual convention, Narragansett Pier, R. I., September 2-4. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

MacGovern & Company, Incorporated, New York City, has issued its June catalog of used apparatus. A number of large generators, turbogenerators and motors are listed.

Meirowsky Brothers, Jersey City, N. J., have recently issued a price list covering sheet mica, block mica and various mica products for use as insulations for electrical machinery and apparatus.

The Adapti Manufacturing Company, Cleveland, O., announces that after July 1 its address will be 919 West Street. It has been found necessary, owing to the great increase in the demand for this company's apparatus, to move into larger quarters. A three-story building has been leased for a term of years and its entire capacity will be utilized by the company.

Wagner Electric Manufacturing Company, St. Louis, Mo., has issued a handsome art calendar, the calendar pad covering the remainder of this year and part of next year. The last sheet of the pad contains a small calendar

covering the period up to the middle of 1916.

Dielectric Manufacturing Company, St. Louis, Mo., has recently issued a pamphlet containing data on various insulating paints and varnishes, impregnating compounds, sealing compounds, mica insulations and varnished tapes. A number of insulation curves showing the dielectric strengths of the various types of insulations described under several conditions are given.

Western Electric Company, New York City, has recently issued a folder illustrating and describing numerous sales helps for electric washers. This folder lists a number of electrotypes for newspaper advertisements, lantern slides, mailing folders, street-car cards and window displays, all of which will be imprinted and sent free to interested dealers.

Phoenix Electric Lamp Company, Incorporated, 253 Thirty-Sixth Street, Brooklyn, N. Y., has absorbed the **United Electric Lamp Company.** Arrangements are being made to establish an office in New York. J. H. Rees, former manager of the United Electric Lamp Company, has been appointed general manager of the Phoenix Electric Lamp Company, Incorporated.

The Waverley Company, Indianapolis, Ind., has recently issued a handsome new-model announcement. This announcement covers the new four-chair car, known as model No. 109. Changes in the shape of the car, enlarged windows and improved batteries are among the new features. The announcement booklet contains a number of excellent reproductions of the car and its parts.

The Robbins & Myers Company, Springfield, O., has recently issued a bulletin describing Type F direct-current factory sewing-machine motors. These motors are designed so as to be able to do such heavy service as is required in tent and awning factories, mattress factories, etc. The motor can be started, stopped or speed regulated by means of varying the pressure of the foot on the treadle.

The Electric Storage Battery Company, Philadelphia, Pa., has issued bulletin No. 144 devoted to the principles of its axle-lighting system for railway trains. The dynamo employed of this system is designed for constant voltage rather than constant current, and the dynamo instead of the battery controls the circuit voltages. The bulletin fully describes and illustrates the system and a typical performance record is given.

The Hess-Bright Manufacturing Company, Philadelphia, Pa., has issued a pamphlet discussing the application of ball bearings to axle-lighting generators. This pamphlet, which is well illustrated, discusses the hard service that bearings of train-lighting axle generators must stand, and shows the adaptability of ball bearings to this service. Two loose-leaf binder pages covering ball-bearing mountings for columns of jib cranes and for semi-floating rear hubs have been issued. Another publication that has recently been issued is devoted to the application of ball bearings to flour and feed-milling machinery.

Allgemeine Elektricitäts Gesellschaft, Berlin, Germany, has published a finely illustrated book entitled "Lade und Löschvorrichtungen." This describes a very ingenious system for loading and unloading vessels while at sea. The system is electrically operated and is used for coaling vessels either from colliers at sea or from coaling stations on land to which the vessel cannot tie up; it also has been used quite extensively on the coasts of Chili and Peru for loading nitre and other products to steamers without extra handling on lighters. The system is very fully described with the aid of numerous illustrations, both of the equipment and of vessels using the system.

Standard Underground Cable Company, Pittsburgh, Pa., has recently issued bulletin No. 680-1, describing steel-tape-armored cables. These cables provide a convenient and economical method of installing underground transmission lines for electric light or power service at a low cost. The bulletin is well illustrated by cuts showing the construction of these cables. A full line of fittings for use with this cable are described and illustrated, and complete information regarding the installing of the cable and fittings is included. The company has also issued a folder describing and illustrating Standard wires, cables and cable accessories. This folder includes trolley wire, copper-clad steel wire, weatherproof wires and cables, rubber-insulated wires, lead-covered and steel-tape armored cables and fittings for the same.

Pass & Seymour, Incorporated, Solvay, N. Y., have recently issued catalog No. 22 which is an 80-page book listing, illustrating and describing P & S handy electrical wiring devices. Three pages of this catalog are devoted to color illustrations showing in an excellent manner the various special socket-shell finishes. Another special feature is that of a handy list of conduit box fittings of various manufacture that may be used with the company's outlet-box receptacles. Several excellent views of spectular outline lighting accomplished by means of P & S ready-wired sockets are given. Numerous types of key, keyless, pull-chain, Shurlok and other sockets, wall receptacles, outlet-box receptacles, interchangeable porcelain sockets, weatherproof sockets, switch rosettes, ready-wired porcelain sockets, sign receptacles, miscellaneous fittings, etc., are included in this catalog.

Standard Electric Stove Company, Toledo, O., has been incorporated with $100,000 capital to manufacture electric heating appliances for use in homes, hotels, restaurants, railroad dining cars and ocean-going vessels. The new concern has opened offices on North Twelfth Street, near Jackson Avenue, where it will begin the manufacture of electric stoves and other kitchen appliances within a very short time. Perry C. Tiedemann is president; S. L. Kelly, first vice-president and manager; Charles S. Turner, second vice-president; Luther Smith, secretary; F. M. Bostater, treasurer. Luther Smith has been identified with the stove-manufacturing business for many years and has spent most of his time during the past five years perfecting the electric cook stove which is to be the leading product of the new plant. It is stated that the new concern will begin a nation-wide advertising campaign for its product within sixty days.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a number of new publications. "Drawing the Crowd and Keeping It" is the title of a folder with an exceedingly attractive cover showing a large crowd being attracted to a motion-picture theater. The folder deals with arc lamps for illumination and projection purposes, rectifiers, ozonizers, and radiators, all of which are used in these theaters. Reasons are advanced for attracting the crowd to these places of amusement and for making the conditions so pleasant that the crowd will remain. Westinghouse Railway Data Exchange No. 8 deals with the efficient use of cars, giving considerable data as to the relative cost of operation of different systems. The cost of stops is also treated and some interesting data in dollars and cents given as to the cost of different lines. Westinghouse Wicker Type Electric Linotype Pots is the title of a somewhat elaborate publication in which the linotype pot is described and illustrated.

Record of Electrical Patents.

Issued by the United States Patent Office, June 9, 1914.

1,099,164. Party-Line Ringing Key. A. J. Carter, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Has interlocking means to restore keys to normal position.

1,099,199. Thermic Balance or Radiometer. R .D. Parker, Ann Arbor, Mich. A Wheatstone bridge arrangement.

1,099,241. Rectifier. T. A. Edison, West Orange, N. J. A rotating-segment rectifier. (See cut on next page.)

1,099,259. Electric Traffic-Controlling System for Railroads. W. H. Lane and A. V. T. Day, assignors to Hall Switch & Signal Co., New York, N. Y. An alternating-current signal system with primaries of transformers connected across rails.

1,099,283. Railway Signaling System. A. V. T. Day, assignor to Hall Switch & Signal Co., New York, N. Y. A track-operated alternating-current signaling system.

1,099,313. Electric Switch. J. G. Peterson, Hartford, Conn. A rocker switch.

1,099,332. Circuit-Breaker. C. Aalborg, assignor to Westinghouse Electric & Mfg. Co. Covers details.

1,099,338. Combined Signaling and Telephone System. M. J. Carney, Chicago, Ill. Employs a normally charged circuit.

1,099,343. Automatic-Exchange Selector. E. B. Craft, assignor to Western Electric Co., New York, N. Y. An electromagnet-operated rotary selector.

1,099,365. Combined Spark Plug and Vaporizer for Internal-Combustion Engines. J. C. Henderson, Washington, D. C. Includes heating coil.

1,099,374. Insulator. I. Hunter, assignor of two-thirds to G. C. Rafferty, Carlisle, Ky., and one-third to L. Wells. A grooved insulator.

1,099,375. Electrode Material for Vapor Electric Apparatus. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Composed of mercury and a fractional percentage of lead.

1,099,380. Cable-Telegraph System. I. Kitsee, assignor to American Telephone & Telegraph Co., New York, N. Y. Covers details.

1,099,381. Electric Pocket Lamp. W. Krafft, Berlin, Germany. Has a series resistance mounted on one of the spring contacts.

1,099,384. Trolley Pole. J. Ledwinka, assignor to Trackless Trolley Co. of America. For trackless vehicles.

1,099,386. Station Indicator. C. S. Mackearnin, Boston, Mass. A motor-operated magnetically controlled station sign for cars.

1,099,397. Alarm System. G. A. Sabine, Robinson, Md. Operates upon change of resistance.

1,099,406. Relay for Telephones. C. Stille, Wilmersdorf, Germany. Microphonic contact, located within two rotatably suspended coils. (See cut.)

1,099,421. High-Voltage Switch. A. W. Burke, Pittsburgh, Pa. Covers details of an arc-horn switch.

1,099,440. Electrical Induction Furnace. K. A. F. Hiorth, Christiania Norway. Covers details of coil arrangement.

1,099,475. Flash Lamp. O. R. Tucker, St. Louis, Mo. A signal lamp for attaching to arm of vehicle operator.

1,099,480. Signal Alarm. F. Winter, New York, N. Y. Conducting wires inbedded in glass window.

1,099,512. Safety Stop. L. R. Palmer, Pittsburgh, Pa. Means for braking by short-circuiting series motor.

1,099,550. Telephone Set. P. L. Jensen and E. S. Pridham, assignors to Commercial Wireless & Development Co., San Francisco, Cal. Has a special sounding box.

1,099,558. Electrode. F. J. Machalske, assignor to American Ferrolectride Corporation, Plattsburg, N. Y. A magnesium and carbon electrode for smelting furnaces.

1,099,559. Electric Furnace. F. J. Machalske, assignor to American Ferrolectride Corporation. A carbon and magnesite wall construction.

1,099,562. Electrical Current-Limiting Device, M. Mertens, assignor to General Electric Co. Means for intermittently interrupting current when it exceeds predetermined value.

1,099,589. Fuse. F. B. Cook, assignor to Frank B. Cook Company, Chicago, Ill. Covers details of arranging and supporting wire in inclosed fuses.

1,099,590. Protective Device. E. E. F. Creighton, assignor to General Electric Co. Includes selective inductive discharge path through arrester to ground.

1,099,625. Motor-Operated Switch. H. M. Stevens, assignor to General Electric Co. Covers details.

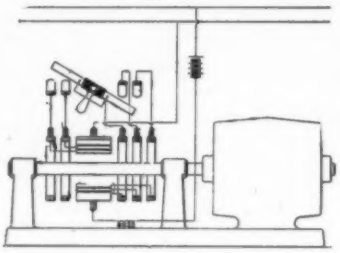
1,099,635. Non Short-Circuiting Lamp Socket. E. E. Brown, Philadelphia, Pa. Has a spring contact for center contact.

1,099,654. Method and Means for Treating Electrodes. C. P. Landreth, Philadelphia, Pa. Includes means for rendering both electrodes electronegative.

1,099,673. Automatic Ship's-Telegraph Alarm. J. A. Sullivan, Victoria, British Columbia, Canada. A dial-operated engine-room signal.

1,099,680. Pneumatic-Cleaner Controller. E. F. Weirich, assignor of four-fifths to L. D. Matchette, Milwaukee, Wis. Motor-control circuit carried along vacuum pipe.

1,099,683. Meter-Control Panel Board. F. B. Adam, assignor to Frank



1,099,241.—Rectifier.

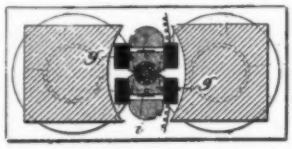
Adam Electric Co., St. Louis, Mo. An adjustable plug meter shunt.

1,099,704. Manufacture of Metallic Illuminating Bodies for Electric Incandescent Lamps. E. Hurwitz, assignor to General Electric Co. Cementing process eliminated.

1,099,721. Incandescent Lamp. M. von Pirani, assignor to General Electric Co. Silver chloride contained in bulb.

1,099,744. Guard for Electric Conductors. H. W. Gonia, Berwind, W. Va. A pair of vertical hinged boards protect wires.

1,099,783. Electric Shade Holder. L. W. Andersen, assignor to The



1,099,406.—Telephone Relay.

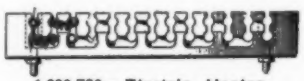
Plume & Atwood Mfg. Co., Waterbury, Conn. A combined shade holder and socket.

1,099,786. Electric Heater. C. F. Brown and W. T. Lowry, assignors to C. S. Steward, Chattanooga, Tenn. A plate for supporting and insulating two separate heating coils. (See cut.)

1,099,812. Circuit Contact-Closing Device. G. C. Murphy, Louisville, Ky. A plunger contact device.

1,099,861. Portable Wireless-Station Tower. J. Raes, Schenectady, N. Y., assignor of thirteen-fiftieths to E. F. Wetherell and four twenty-fifths to S. W. Berry, and four twenty-fifths to J. Raes. Has sectional masts and sectional six-wheel wagon body.

1,099,865. Wireless Receiving System. E. G. Stalnaker, minor; C. W.



1,099,786.—Electric Heater.

Stalnaker, guardian, assignor to C. W. Hoff, Chicago, Ill. Has a rotating tuning coil and means for stopping same upon synchronism with sending station

1,099,879. Barber Pole. F. O. Hutchings, San Francisco, Cal. Motor rotates the device and controls flashing lamps.

Patents Expired.

The following United States electrical patents expired June 15, 1914:

584,338. Magneto Apparatus. H. H. Eldred, Brooklyn, N. Y.

584,341. Apparatus for Controlling Electric Motors. B. A. Fiske, U. S. Navy.

584,342. Current Motor. W. P. Francis, Philadelphia, Pa.

584,352. Party-Line Telephone System. W. H. Harter, Norwalk, O.

584,356. Electric Arc Lamp. I. H. Hegner, Paris, France.

584,382. Electrical Circuit-Closing Thermometer. A. Luraschi, London, England.

584,384. Automatic Electric Signal-Transmitter. A. B. Macklin, New York, N. Y.

584,393. Telephone System. F. R. McBerty, Downer's Grove, Ill.

584,414. Apparatus for Telephone Switchboards. C. E. Scribner, Chicago.

584,415. Telephone-Line Circuit. C. E. Scribner.

584,416. Electromagnet. C. E. Scribner.

584,417. Telephone Circuit. C. E. Scribner.

584,418. Spring-Jack for Telephone Switchboards. C. E. Scribner.

584,420. Hoisting Machinery. A. J. Shaw, Muskegon, Mich.

584,427. Production of electric Sparks for Signals or Theatrical Effects. Tabulewitsch, St. Petersburg, Russia.

584,428. Flexible Conduit. A. L. Tucker, Chicago, Ill.

584,431. Armature for Dynamo-Electric Machines. H. H. Wait, Chicago, Ill.

584,462. Electric-Circuit Protector. A. L. Creelman, Memphis, Tenn.

584,463. Electric Signal. A. L. Creelman.

584,464. Telegraph Sounder. A. L. Creelman.

584,465. Circuit-Protecting Sounder. A. L. Creelman.

584,466. Telegraphic Sounder. A. L. Creelman.

584,474. Primary Cell. I. Kitsee, Philadelphia, Pa.

584,476 and 584,477. Insulator. S. H. Libby.

584,482. System of Distribution. E. W. Rice, Jr., Schenectady, N. Y.

584,496. Electric Headlight. F. W. Dressel, Yew York, N. Y.

584,511. Electric Railway. T. W. Kloman, Montclare, N. J.

584,618. Telephone Transmitter. H. C. Alexander, Bonham, Tex.

584,632. Lightning Arrester and Multiple Automatic Fuse-Block. G. X. Gast, New Orleans, La.

584,639. Electric Railway. H. M. Jones, Meridan, Conn.

584,644. Bond for Electric Railways. F. T. Newberry, San Francisco, Cal.

584,649. Secondary-Battery Plate and Method of Producing Same. W. P. Patton, Jersey City, N. J.

584,694. Increasing Illuminating Power of Electric Arc Lamps. P. Mersch, Paris, Frace.

584,700. Electrical Advertising Annunciator for Cars. J. P. Orr and G. H. Fugh, Pittsburgh, Pa.

584,722. Perforator for Electric Telegraphs. C. G. Burke, Brooklyn, N. Y.

584,733. Electric Wire-Barbing Machine. W. O. Bates and W. J. Hutchins, Joliet, Ill.

584,737. Telephone. C. C. Gould, Philadelphia, Pa.

584,750. Incandescent Electric Lamp. C. E. Scribner, Chicago, Ill.